



Ethernet Switch Series

Intelligent Ethernet Switches

Versions: 3.79, 3.80, 3.90, 4.00, 4.10, 4.20, 4.30

Edition 1, 09/2015

CLI Reference Guide

Default Login Details

| | |
|----------------------|---|
| Out-Of-Band Mgt Port | http://192.168.0.1 |
| In-Band Ports | http://192.168.1.1 |
| User Name | admin |
| Password | 1234 |



IMPORTANT!
READ CAREFULLY BEFORE USE.
KEEP THIS GUIDE FOR FUTURE REFERENCE.

This is a Reference Guide for a series of products. Not all products support all firmware features. Screenshots, graphics and commands in this book may differ slightly from your product due to differences in your product firmware or your computer operating system. Every effort has been made to ensure that the information in this manual is accurate.

Related Documentation

- User's Guide
The User's Guide explains how to use the Web Configurator to configure the Switch.



It is recommended you use the Web Configurator to configure the Switch.

About This CLI Reference Guide

Intended Audience

This manual is intended for people who want to configure ZyXEL Switches via Command Line Interface (CLI).

The version number on the cover page refers to the latest firmware version supported by the ZyXEL Switches. This guide applies to version 3.79, 3.80, 3.90, 4.00, 4.10, 4.20 and 4.30 at the time of writing.



This guide is intended as a command reference for a series of products. Therefore many commands in this guide may not be available in your product. See your User's Guide for a list of supported features and details about feature implementation.

Please refer to www.zyxel.com for product specific User Guides and product certifications.

How To Use This Guide

- Read the **How to Access the CLI** chapter for an overview of various ways you can get to the command interface on your Switch.
- Use the **Reference** section in this guide for command syntax, description and examples. Each chapter describes commands related to a feature.
- To find specific information in this guide, use the **Contents Overview**, the **Index of Commands**, or search the PDF file. E-mail techwriters@zyxel.com.tw if you cannot find the information you require.

Document Conventions

Warnings and Notes

These are how warnings and notes are shown in this CLI Reference Guide.



Warnings tell you about things that could harm you or your device. See your User's Guide for product specific warnings.



Notes tell you other important information (for example, other things you may need to configure or helpful tips) or recommendations.

Syntax Conventions

This manual follows these general conventions:

- ZyXEL's switches may be referred to as the "Switch", the "device", the "system" or the "product" in this Reference Guide.
- Units of measurement may denote the "metric" value or the "scientific" value. For example, "k" for kilo may denote "1000" or "1024", "M" for mega may denote "1000000" or "1048576" and so on.

Command descriptions follow these conventions:

- Commands are in `courier new font`.
- Required input values are in angle brackets `<>`; for example, `ping <ip>` means that you must specify an IP address for this command.
- Optional fields are in square brackets `[]`; for instance `show logins [name]`, the name field is optional.

The following is an example of a required field within an optional field: `snmp-server [contact <system contact>]`, the `contact` field is optional. However, if you use `contact`, then you must provide the `system contact` information.

- Lists (such as `<port-list>`) consist of one or more elements separated by commas. Each element might be a single value (1, 2, 3, ...) or a range of values (1-2, 3-5, ...) separated by a dash.
- The `|` (bar) symbol means "or".
- *italic* terms represent user-defined input values; for example, in `snmp-server [contact <system contact>]`, `system contact` can be replaced by the administrator's name.
- A key stroke is denoted by square brackets and uppercase text, for example, `[ENTER]` means the "Enter" or "Return" key on your keyboard.

- <cr> means press the [ENTER] key.
- An arrow (-->) indicates that this line is a continuation of the previous line.

Command summary tables are organized as follows:

Table 1 Example: Command Summary Table

| COMMAND | DESCRIPTION | M | P |
|------------------|---|---|----|
| show vlan | Displays the status of all VLANs. | E | 3 |
| vlan <1-4094> | Enters config-vlan mode for the specified VLAN. Creates the VLAN, if necessary. | C | 13 |
| inactive | Disables the specified VLAN. | C | 13 |
| no inactive | Enables the specified VLAN. | C | 13 |
| no vlan <1-4094> | Deletes a VLAN. | C | 13 |

The **Table** title identifies commands or the specific feature that the commands configure.

The **COMMAND** column shows the syntax of the command.

- If a command is not indented, you run it in the enable or config mode. See [Chapter 2 on page 14](#) for more information on command modes.
- If a command is indented, you run it in a sub-command mode.

The **DESCRIPTION** column explains what the command does. It also identifies legal input values, if necessary.

The **M** column identifies the mode in which you run the command.

- **E**: The command is available in enable mode. It is also available in user mode if the privilege level (**P**) is less than 13.
- **C**: The command is available in config (not indented) or one of the sub-command modes (indented).

The **P** column identifies the privilege level of the command. If you don't have a high enough privilege level you may not be able to view or execute some of the commands. See [Chapter 2 on page 14](#) for more information on privilege levels.

Contents Overview

| | |
|---|------------|
| Introduction | 9 |
| How to Access and Use the CLI | 11 |
| Privilege Level and Command Mode | 14 |
| Initial Setup | 19 |
| Reference A-G | 22 |
| AAA Commands | 24 |
| Anti-Arpcan | 27 |
| ARP Commands | 29 |
| ARP Inspection Commands | 31 |
| ARP Learning Commands | 36 |
| Bandwidth Commands | 37 |
| BPDU Guard | 40 |
| Broadcast Storm Commands | 41 |
| CFM Commands | 44 |
| Classifier Commands | 53 |
| Cluster Commands | 57 |
| Date and Time Commands | 60 |
| Data Center Bridging Commands | 63 |
| DHCP Commands | 71 |
| DHCP Snooping & DHCP VLAN Commands | 76 |
| DiffServ Commands | 80 |
| Display Commands | 81 |
| DVMRP Commands | 82 |
| Error Disable and Recovery Commands | 84 |
| Ethernet OAM Commands | 88 |
| External Alarm Commands | 94 |
| GARP Commands | 96 |
| Green Ethernet Commands | 98 |
| GVRP Commands | 102 |
| Reference H-M | 103 |
| HTTPS Server Commands | 105 |
| IEEE 802.1x Authentication Commands | 109 |
| IGMP and Multicasting Commands | 112 |
| IGMP Snooping Commands | 115 |
| IGMP Filtering Commands | 122 |

| | |
|---|------------|
| Interface Commands | 124 |
| Interface Route-domain Mode | 129 |
| IP Commands | 130 |
| IP Source Binding Commands | 135 |
| IPv6 Commands | 137 |
| Layer 2 Protocol Tunnel (L2PT) Commands | 162 |
| Link Layer Discovery Protocol (LLDP) Commands | 165 |
| Load Sharing Commands | 177 |
| Logging Commands | 179 |
| Login Account Commands | 180 |
| Loopguard Commands | 181 |
| MAC Address Commands | 183 |
| MAC Authentication Commands | 185 |
| MAC-based VLAN | 187 |
| MAC Filter Commands | 189 |
| MAC Forward Commands | 191 |
| MAC Pinning Commands | 192 |
| Mirror Commands | 194 |
| MRSTP Commands | 198 |
| MSTP Commands | 201 |
| Multiple Login Commands | 206 |
| MVR Commands | 207 |
| Reference N-S | 209 |
| OSPF Commands | 211 |
| Password Commands | 217 |
| PoE Commands | 219 |
| Policy Commands | 223 |
| Policy Route Commands | 227 |
| Port Security Commands | 229 |
| Port-based VLAN Commands | 231 |
| PPPoE IA Commands | 232 |
| Private VLAN Commands | 238 |
| Protocol-based VLAN Commands | 243 |
| Queuing Commands | 245 |
| RADIUS Commands | 249 |
| Remote Management Commands | 251 |
| RIP Commands | 254 |
| RMON | 256 |
| Running Configuration Commands | 262 |
| sFlow | 264 |
| Smart Isolation Commands | 266 |
| SNMP Server Commands | 270 |

| | |
|---|------------|
| Stacking Commands | 275 |
| STP and RSTP Commands | 281 |
| SSH Commands | 285 |
| Static Multicast Commands | 287 |
| Static Route Commands | 289 |
| Subnet-based VLAN Commands | 292 |
| Syslog Commands | 294 |
| Reference T-Z | 296 |
| TACACS+ Commands | 298 |
| Tech Support Commands | 299 |
| TFTP Commands | 302 |
| Time Range Commands | 303 |
| Traceroute Commands | 305 |
| Trunk Commands | 306 |
| trTCM Commands | 309 |
| VLAN Commands | 312 |
| VLAN IP Commands | 318 |
| VLAN Mapping Commands | 320 |
| VLAN Port Isolation Commands | 322 |
| VLAN Stacking Commands | 323 |
| VLAN Trunking Commands | 326 |
| Voice VLAN Commands | 327 |
| VRRP Commands | 330 |
| ZULD Commands | 334 |
| Additional Commands | 336 |
| Appendices and Index of Commands | 348 |

PART I

Introduction

How to Access and Use the CLI (11)

Privilege Level and Command Mode (14)

Initial Setup (19)

How to Access and Use the CLI

This chapter introduces the command line interface (CLI).

1.1 Accessing the CLI

Use any of the following methods to access the CLI.

1.1.1 Console Port

- 1 Connect your computer to the console port on the Switch using the appropriate cable.
- 2 Use terminal emulation software with the following settings:

Table 2 Default Settings for the Console Port

| SETTING | DEFAULT VALUE |
|---------------------|---------------|
| Terminal Emulation | VT100 |
| Baud Rate | 9600 bps |
| Parity | None |
| Number of Data Bits | 8 |
| Number of Stop Bits | 1 |
| Flow Control | None |

- 3 Press [ENTER] to open the login screen.

1.1.2 Telnet

- 1 Connect your computer to one of the Ethernet ports.
- 2 Open a Telnet session to the Switch's IP address. If this is your first login, use the default values.

Table 3 Default Management IP Address

| SETTING | DEFAULT VALUE |
|-------------|---------------|
| IP Address | 192.168.1.1 |
| Subnet Mask | 255.255.255.0 |

Make sure your computer IP address is in the same subnet, unless you are accessing the Switch through one or more routers.

1.1.3 SSH

- 1 Connect your computer to one of the Ethernet ports.
- 2 Use a SSH client program to access the Switch. If this is your first login, use the default values in [Table 3 on page 11](#) and [Table 4 on page 12](#). Make sure your computer IP address is in the same subnet, unless you are accessing the Switch through one or more routers.

1.2 Logging in

Use the administrator username and password. If this is your first login, use the default values.

Table 4 Default User Name and Password

| SETTING | DEFAULT VALUE |
|-----------|---------------|
| User Name | admin |
| Password | 1234 |



The Switch automatically logs you out of the management interface after five minutes of inactivity. If this happens to you, simply log back in again.

1.3 Using Shortcuts and Getting Help

This table identifies some shortcuts in the CLI, as well as how to get help.

Table 5 CLI Shortcuts and Help

| COMMAND / KEY(S) | DESCRIPTION |
|-------------------------|---|
| history | Displays a list of recently-used commands. |
| ↑↓ (up/down arrow keys) | Scrolls through the list of recently-used commands. You can edit any command or press [ENTER] to run it again. |
| [CTRL]+U | Clears the current command. |
| [TAB] | Auto-completes the keyword you are typing if possible. For example, type <code>config</code> , and press [TAB]. The Switch finishes the word <code>configure</code> . |
| ? | Displays the keywords and/or input values that are allowed in place of the ?. |
| help | Displays the (full) commands that are allowed in place of help. |

1.4 Saving Your Configuration

When you run a command, the Switch saves any changes to its run-time memory. The Switch loses these changes if it is turned off or loses power. Use the `write memory` command in enable mode to save the current configuration permanently to non-volatile memory.

```
sysname# write memory
```



You should save your changes after each CLI session. All unsaved configuration changes are lost once you restart the Switch.

1.5 Logging Out

Enter `logout` to log out of the CLI. You have to be in user, enable, or config mode. See [Chapter 2 on page 14](#) for more information about modes.

Privilege Level and Command Mode

This chapter introduces the CLI privilege levels and command modes.

- The privilege level determines whether or not a user can run a particular command.
- If a user can run a particular command, the user has to run it in the correct mode.

2.1 Privilege Levels

Every command has a privilege level (0-14). Users can run a command if the session's privilege level is greater than or equal to the command's privilege level. The session's privilege level initially comes from the login account's privilege level, though it is possible to change the session's privilege level after logging in.

2.1.1 Privilege Levels for Commands

The privilege level of each command is listed in the [Reference A-G](#) chapters on page 22.

At the time of writing, commands have a privilege level of 0, 3, 13, or 14. The following table summarizes the types of commands at each of these privilege levels.

Table 6 Types of Commands at Different Privilege Levels

| PRIVILEGE LEVEL | TYPES OF COMMANDS AT THIS PRIVILEGE LEVEL |
|-----------------|--|
| 0 | Display basic system information. |
| 3 | Display configuration or status. |
| 13 | Configure features except for login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, administrator and enable passwords, and configuration information display. |
| 14 | Configure login accounts, SNMP user accounts, the authentication method sequence and authorization settings, multiple logins, and administrator and enable passwords, and display configuration information. |

2.1.2 Privilege Levels for Login Accounts

You can manage the privilege levels for login accounts in the following ways:

- Using commands. Login accounts can be configured by the **admin** account or any login account with a privilege level of 14. See [Chapter 42 on page 180](#).

- Using vendor-specific attributes in an external authentication server. See the User's Guide for more information.

The **admin** account has a privilege level of 14, so the administrator can run every command. You cannot change the privilege level of the **admin** account.

2.1.3 Privilege Levels for Sessions

The session's privilege level initially comes from the privilege level of the login account the user used to log in to the Switch. After logging in, the user can use the following commands to change the session's privilege level.

2.1.3.1 enable Command

This command raises the session's privilege level to 14. It also changes the session to enable mode (if not already in enable mode). This command is available in user mode or enable mode, and users have to know the enable password.

In the following example, the login account **user0** has a privilege level of 0 but knows that the enable password is **123456**. Afterwards, the session's privilege level is 14, instead of 0, and the session changes to enable mode.

```
sysname> enable
Password: 123456
sysname#
```

The default enable password is **1234**. Use this command to set the enable password.

```
password <password>
```

<password> consists of 1-32 alphanumeric characters. For example, the following command sets the enable password to **123456**. See [Chapter 97 on page 336](#) for more information about this command.

```
sysname(config)# password 123456
```

The password is sent in plain text and stored in the Switch's buffers. Use this command to set the cipher password for password encryption.

```
password cipher <password>
```

<password> consists of 32 alphanumeric characters. For example, the following command encrypts the enable password with a 32-character cipher password. See [Chapter 56 on page 217](#) for more information about this command.

```
sysname(config)# password cipher qwertyuiopasdfghjklzxcvbnm123456
```

2.1.3.2 enable <0-14> Command

This command raises the session's privilege level to the specified level. It also changes the session to enable mode, if the specified level is 13 or 14. This command is available in user mode or enable mode, and users have to know the password for the specified privilege level.

In the following example, the login account **user0** has a privilege level of 0 but knows that the password for privilege level 13 is **pswd13**. Afterwards, the session's privilege level is 13, instead of 0, and the session changes to enable mode.

```
sysname> enable 13
Password: pswd13
sysname#
```

Users cannot use this command until you create passwords for specific privilege levels. Use the following command to create passwords for specific privilege levels.

```
password <password> privilege <0-14>
```

<password> consists of 1-32 alphanumeric characters. For example, the following command sets the password for privilege level 13 to **pswd13**. See [Chapter 97 on page 336](#) for more information about this command.

```
sysname(config)# password pswd13 privilege 13
```

2.1.3.3 disable Command

This command reduces the session's privilege level to 0. It also changes the session to user mode. This command is available in enable mode.

2.1.3.4 show privilege command

This command displays the session's current privilege level. This command is available in user mode or enable mode.

```
sysname# show privilege
Current privilege level : 14
```

2.2 Command Modes

The CLI is divided into several modes. If a user has enough privilege to run a particular command, the user has to run the command in the correct mode. The modes that are available depend on the session's privilege level.

2.2.1 Command Modes for Privilege Levels 0-12

If the session's privilege level is 0-12, the user and all of the allowed commands are in user mode. Users do not have to change modes to run any allowed commands.

2.2.2 Command Modes for Privilege Levels 13-14

If the session's privilege level is 13-14, the allowed commands are in one of several modes.

Table 7 Command Modes for Privilege Levels 13-14 and the Types of Commands in Each One

| MODE | PROMPT | COMMAND FUNCTIONS IN THIS MODE |
|---------------------|------------------------------|---|
| enable | sysname# | Display current configuration, diagnostics, maintenance. |
| config | sysname (config) # | Configure features other than those below. |
| config-interface | sysname (config-interface) # | Configure ports. |
| config-mvr | sysname (config-mvr) # | Configure multicast VLAN. |
| config-route-domain | sysname (config-if) # | Enable and enter configuration mode for an IPv4 or IPv6 routing domain. |
| config-dvmrp | sysname (config-dvmrp) # | Configure Distance Vector Multicast Routing Protocol (DVRMP). |
| config-igmp | sysname (config-igmp) # | Configure Internet Group Management Protocol (IGMP). |
| config-ma | sysname (config-ma) # | Configure an Maintenance Association (MA) in Connectivity Fault Management (CFM). |
| config-ospf | sysname (config-ospf) # | Configure Open Shortest Path First (OSPF) protocol. |
| config-rip | sysname (config-rip) # | Configure Routing Information Protocol (RIP). |
| config-vrrp | sysname (config-vrrp) # | Configure Virtual Router Redundancy Protocol (VRRP). |

Each command is usually in one and only one mode. If a user wants to run a particular command, the user has to change to the appropriate mode. The command modes are organized like a tree, and users start in enable mode. The following table explains how to change from one mode to another.

Table 8 Changing Between Command Modes for Privilege Levels 13-14

| MODE | ENTER MODE | LEAVE MODE |
|---------------------|---|------------|
| enable | -- | -- |
| config | configure | exit |
| config-interface | interface port-channel <port-list> | exit |
| config-mvr | mvr <1-4094> | exit |
| config-vlan | vlan <1-4094> | exit |
| config-route-domain | interface route domain <ip-address>/<mask-bits> | exit |
| config-dvmrp | router dvmrp | exit |
| config-igmp | router igmp | exit |
| config-ospf | router ospf <router-id> | exit |
| config-rip | router rip | exit |
| config-vrrp | router vrrp network <ip-address>/<mask-bits> vr-id <1~7> uplink-gateway <ip-address> | exit |

2.3 Listing Available Commands

Use the `help` command to view the executable commands on the Switch. You must have the highest privilege level in order to view all the commands. Follow these steps to create a list of supported commands:

- 1 Log into the CLI. This takes you to the enable mode.
- 2 Type `help` and press [ENTER]. A list comes up which shows all the commands available in enable mode. The example shown next has been edited for brevity's sake.

```
sysname# help
  Commands available:

  help
  logout
  exit
  history
  enable <0-14>
  enable <cr>
  .
  .
  traceroute <ip|host-name> [vlan <vlan-id>] [..]
  traceroute help
  ssh <1|2> <[user@]dest-ip> <cr>
  ssh <1|2> <[user@]dest-ip> [command </>]
sysname#
```

- 3 Copy and paste the results into a text editor of your choice. This creates a list of all the executable commands in the user and enable modes.
- 4 Type `configure` and press [ENTER]. This takes you to the config mode.
- 5 Type `help` and press [ENTER]. A list is displayed which shows all the commands available in config mode and all the sub-commands. The sub-commands are preceded by the command necessary to enter that sub-command mode. For example, the command name `<name-str>` as shown next, is preceded by the command used to enter the config-vlan sub-mode: `vlan <1-4094>`.

```
sysname# help
.
.
no arp inspection log-buffer logs
no arp inspection filter-aging-time
no arp inspection <cr>
vlan <1-4094>
vlan <1-4094> name <name-str>
vlan <1-4094> normal <port-list>
vlan <1-4094> fixed <port-list>
```

- 6 Copy and paste the results into a text editor of your choice. This creates a list of all the executable commands in config and the other submodes, for example, the config-vlan mode.

Initial Setup

This chapter identifies tasks you might want to do when you first configure the Switch.

3.1 Changing the Administrator Password



It is recommended you change the default administrator password. You can encrypt the password using the `password encryption` command. See [Chapter 56 on page 217](#) for more information.

Use this command to change the administrator password.

```
admin-password <pw-string> <Confirm-string>
```

where *<pw-string>* may be 1-32 alphanumeric characters long.

```
sysname# configure
sysname(config)# admin-password t1g2y7i9 t1g2y7i9
```

3.2 Changing the Enable Password



It is recommended you change the default enable password. You can encrypt the password using the `password encryption` command. See [Chapter 56 on page 217](#) for more information.

Use this command to change the enable password.

```
password <password>
```

where *<password>* may be 1-32 alphanumeric characters long.

```
sysname# configure
sysname(config)# password k8s8s3dl0
```

3.3 Prohibiting Concurrent Logins

By default, multiple CLI sessions are allowed via the console port or Telnet. See the User's Guide for the maximum number of concurrent sessions for your Switch. Use this command to prohibit concurrent logins.

```
no multi-login
```

Console port has higher priority than Telnet. See [Chapter 53 on page 206](#) for more multi-login commands.

```
sysname# configure
sysname(config)# no multi-login
```

3.4 Changing the Management IP Address

The Switch has a different IP address in each VLAN. By default, the Switch has VLAN 1 with IP address 192.168.1.1 and subnet mask 255.255.255.0. Use this command in config-vlan mode to change the management IP address in a specific VLAN.

```
ip address <ip> <mask>
```

This example shows you how to change the management IP address in VLAN 1 to 172.16.0.1 with subnet mask 255.255.255.0.

```
sysname# configure
sysname(config)# vlan 1
sysname(config-vlan)# ip address default-management 172.16.0.1 255.255.255.0
```



Afterwards, you have to use the new IP address to access the Switch.

3.5 Changing the Out-of-band Management IP Address

If your Switch has a **MGMT** port (also referred to as the out-of-band management port), then the Switch can also be managed via this interface. By default, the **MGMT** port IP address is 192.168.0.1 and the subnet mask is 255.255.255.0. Use this command in config mode to change the out-of-band management IP address.

```
ip address <ip> <mask>
```

This example shows you how to change the out-of-band management IP address to 10.10.10.1 with subnet mask 255.255.255.0 and the default gateway 10.10.10.254

```
sysname# configure
sysname(config)# ip address 10.10.10.1 255.255.255.0
sysname(config)# ip address default-gateway 10.10.10.254
```

3.6 Looking at Basic System Information

Use this command to look at general system information about the Switch.

```
show system-information
```

This is illustrated in the following example.

```
sysname# show system-information

Product Model       : sysname
System Name        : sysname
System Mode        : Standalone
System Contact     :
System Location    :
System up Time     :    98:26:28 (151f8939 ticks)
Ethernet Address   : 00:19:cb:00:00:02
Bootbase Version   : V1.02 | 08/27/2014
ZyNOS F/W Version  : V4.20(AASS.0)b3 | 09/24/2014
Config Boot Image  : 1
Current Boot Image : 1
RomRasSize        : 8336318
sysname#
```

See [Chapter 97 on page 336](#) for more information about these attributes.

3.7 Looking at the Operating Configuration

Use this command to look at the current operating configuration.

```
show running-config
```

This is illustrated in the following example.

```
sysname# show running-config
Building configuration...

Current configuration:

vlan 1
 name 1
 normal ""
 fixed 1-9
 forbidden ""
 untagged 1-9
 ip address default-management 172.16.37.206 255.255.255.0
 ip address default-gateway 172.16.37.254
exit
```

PART II

Reference A-G

AAA Commands (24)
ARP Commands (29)
ARP Inspection Commands (31)
ARP Learning Commands (36)
Bandwidth Commands (37)
Broadcast Storm Commands (41)
CFM Commands (44)
Classifier Commands (53)
Cluster Commands (57)
Date and Time Commands (60)
Data Center Bridging Commands (63)
DHCP Commands (71)
DHCP Snooping & DHCP VLAN Commands (76)
DiffServ Commands (80)
Display Commands (81)
DVMRP Commands (82)
Error Disable and Recovery Commands (84)
Ethernet OAM Commands (88)
External Alarm Commands (94)
GARP Commands (96)
Green Ethernet Commands (98)
GVRP Commands (102)

AAA Commands

Use these commands to configure authentication, authorization and accounting on the Switch.

4.1 Command Summary

The following section lists the commands for this feature.

Table 9 aaa authentication Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| show aaa authentication | Displays what methods are used for authentication. | E | 3 |
| show aaa authentication enable | Displays the authentication method(s) for checking privilege level of administrators. | E | 3 |
| aaa authentication enable <method1> [<method2> ...] | Specifies which method should be used first, second, and third for checking privileges. <i>method</i> : enable, radius, or tacacs+. | C | 14 |
| no aaa authentication enable | Resets the method list for checking privileges to its default value. | C | 14 |
| show aaa authentication login | Displays the authentication methods for administrator login accounts. | E | 3 |
| aaa authentication login <method1> [<method2> ...] | Specifies which method should be used first, second, and third for the authentication of login accounts. <i>method</i> : local, radius, or tacacs+. | C | 14 |
| no aaa authentication login | Resets the method list for the authentication of login accounts to its default value. | C | 14 |

Table 10 Command Summary: aaa accounting

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| show aaa accounting | Displays accounting settings configured on the Switch. | E | 3 |
| show aaa accounting update | Display the update period setting on the Switch for accounting sessions. | E | 3 |
| aaa accounting update periodic <1-2147483647> | Sets the update period (in minutes) for accounting sessions. This is the time the Switch waits to send an update to an accounting server after a session starts. | C | 13 |
| no aaa accounting update | Resets the accounting update interval to the default value. | C | 13 |
| show aaa accounting commands | Displays accounting settings for recording command events. | E | 3 |
| aaa accounting commands <privilege> stop-only tacacs+ [broadcast] | Enables accounting of command sessions and specifies the minimum privilege level (0-14) for the command sessions that should be recorded. Optionally, sends accounting information for command sessions to all configured accounting servers at the same time. | C | 13 |

Table 10 Command Summary: aaa accounting (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| no aaa accounting commands | Disables accounting of command sessions on the Switch. | C | 13 |
| show aaa accounting dot1x | Displays accounting settings for recording IEEE 802.1x session events. | E | 3 |
| aaa accounting dot1x <start-stop stop-only> <radius tacacs+> [broadcast] | Enables accounting of IEEE 802.1x authentication sessions and specifies the mode and protocol method. Optionally, sends accounting information for IEEE 802.1x authentication sessions to all configured accounting servers at the same time. | C | 13 |
| no aaa accounting dot1x | Disables accounting of IEEE 802.1x authentication sessions on the Switch. | C | 13 |
| show aaa accounting exec | Displays accounting settings for recording administrative sessions via SSH, Telnet or the console port. | E | 3 |
| aaa accounting exec <start-stop stop-only> <radius tacacs+> [broadcast] | Enables accounting of administrative sessions via SSH, Telnet and console port and specifies the mode and protocol method. Optionally, sends accounting information for administrative sessions via SSH, Telnet and console port to all configured accounting servers at the same time. | C | 13 |
| no aaa accounting exec | Disables accounting of administrative sessions via SSH, Telnet or console on the Switch. | C | 13 |
| show aaa accounting system | Displays accounting settings for recording system events, for example system shut down, start up, accounting enabled or accounting disabled. | E | 3 |
| aaa accounting system <radius tacacs+> [broadcast] | Enables accounting of system events and specifies the protocol method. Optionally, sends accounting information for system events to all configured accounting servers at the same time. | C | 13 |
| no aaa accounting system | Disables accounting of system events on the Switch. | C | 13 |

Table 11 aaa authorization Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| show aaa authorization | Displays authorization settings configured on the Switch. | E | 3 |
| show aaa authorization dot1x | Displays the authorization method used to allow an IEEE 802.1x client to have different bandwidth limit or VLAN ID assigned via the external server. | E | 3 |
| show aaa authorization exec | Displays the authorization method used to allow an administrator which logs in the Switch through Telnet or SSH to have different access privilege level assigned via the external server. | E | 3 |
| aaa authorization console | Enables authorization of allowing an administrator which logs in the Switch through the console port to have different access privilege level assigned via the external server. | C | 14 |
| aaa authorization dot1x radius | Enables authorization for IEEE 802.1x clients using RADIUS. | C | 14 |
| aaa authorization exec <radius tacacs+> | Specifies which method (radius or tacacs+) should be used for administrator authorization. | C | 14 |
| no aaa authorization console | Disables authorization of allowing an administrator which logs in the Switch through the console port to have different access privilege level assigned via the external server. | C | 14 |

Table 11 aaa authorization Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|----------|----------|
| <code>no aaa authorization dot1x</code> | Disables authorization of allowing an IEEE 802.1x client to have different bandwidth limit or VLAN ID assigned via the external server. | C | 14 |
| <code>no aaa authorization exec</code> | Disables authorization of allowing an administrator which logs in the Switch through Telnet or SSH to have different access privilege level assigned via the external server. | C | 14 |

Anti-Arpscan

Use these commands to configure anti-Arpscan on the Switch.

5.1 Anti-Arpscan Overview

Address Resolution Protocol (ARP), RFC 826, is a protocol used to convert a network-layer IP address to a link-layer MAC address. ARP scan is used to scan the network of a certain interface for alive hosts. It shows the IP address and MAC addresses of all hosts found. Hackers could use ARP scan to find targets in your network. Anti-arpscan is used to detect unusual ARP scan activity and block suspicious hosts or ports.

Unusual ARP scan activity is determined by port and host thresholds that you set. A port threshold is determined by the number of packets received per second on the port. If the received packet rate is over the threshold, then the port is put into an Err-Disable state. You can recover the normal state of the port manually if this happens and after you identify the cause of the problem.

A host threshold is determined by the number of ARP-request packets received per second. There is a global threshold rate for all hosts. If the rate of a host is over the threshold, then that host is blocked by using a MAC address filter. A blocked host is released automatically after the MAC aging time expires.



A port-based threshold must be larger than the host-based threshold or the host-based threshold will not work.

5.2 Command Summary

The following section lists the commands for this feature.

Table 12 anti arpscan Command Summary

| COMMAND | DESCRIPTION | M | P |
|-------------------------------------|---|---|----|
| anti arpscan | Enables Anti-arpscan on the Switch. | C | 13 |
| anti arpscan host threshold <2-100> | Sets the maximum number of ARP-request packets allowed by a host before it is blocked. If the rate of a host is over the threshold, then that host is blocked by using a MAC address filter. A blocked host is released automatically after the MAC aging time expires. | C | 13 |

Table 12 anti arpscan Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| anti arpscan port threshold <2-255> | Sets the maximum number of packets per second allowed on the port before it is blocked. | C | 13 |
| anti arpscan trust host <ip-address> <mask> [name <name>] | Creates a trusted host identified by IP address and subnet mask. Anti-arpscan is not performed on trusted hosts. | C | 13 |
| clear anti arpscan host | Unblocks all hosts. | E | 13 |
| clear anti arpscan host interface port-channel <port-list> | Unblocks all hosts connected to the specified port(s). | E | 13 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |
| anti arpscan trust | Sets the port as a trusted port. This prevents the port from being shutdown due to receiving too many ARP messages. | C | 13 |
| no anti arpscan | Disables Anti-arpscan on the Switch. | C | 13 |
| no anti arpscan host threshold | Resets the host threshold to its default value. | C | 13 |
| no anti arpscan port threshold | Resets the port threshold to its default value. | C | 13 |
| no anti arpscan trust host <ip-address> <mask> | Removes a trusted host. | C | 13 |
| show anti arpscan | Displays what ports are trusted and are forwarding traffic or are disabled. | E | 3 |
| show anti arpscan host | Displays the host that has been blocked. | E | 3 |

ARP Commands

Use these commands to look at IP-to-MAC address mapping(s).

6.1 Command Summary

The following section lists the commands for this feature.

Table 13 arp Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>arp aging-time <60-1000000></code> | Sets how long dynamically learned ARP entries remain in the ARP table before they age out (and must be relearned). | C | 13 |
| <code>arp name <name> ip <ip-address> mac <mac-addr> vlan <vlan-id> interface port-channel <port-list></code> | Creates a static ARP entry which will not age out. | C | 13 |
| <code>arp name <name> ip <ip-address> mac <mac-addr> vlan <vlan-id> interface port-channel <port-list> inactive</code> | Creates a static ARP entry but disables it. | C | 13 |
| <code>no arp ip <ip-address> mac <mac-addr> vlan <vlan-id></code> | Deletes a static ARP entry from the ARP table. | C | 13 |
| <code>no arp ip <ip-address> mac <mac-addr> vlan <vlan-id> inactive</code> | Enables the specified static ARP entry. | C | 13 |
| <code>show ip arp</code> | Displays the ARP table. | E | 3 |
| <code>clear ip arp</code> | Removes all of the dynamic entries from the ARP table. | E | 13 |
| <code>clear ip arp interface port-channel <port-list></code> | Removes the dynamic entries learned on the specified port. | E | 13 |
| <code>clear ip arp ip <ip-address></code> | Removes the dynamic entries learned with the specified IP address. | E | 13 |
| <code>no arp</code> | Flushes the ARP table entries. | E | 13 |

6.2 Command Examples

This example creates a static ARP entry and shows the ARP table on the Switch.

```

sysname# config
sysname(config)# arp name test ip 192.168.1.99 mac 00:c5:d8:01:23:45 vlan
1 interface port-channel 3
sysname(config)# exit
sysname# show ip arp
  Index    IP             MAC             VLAN  Port    Age(s)  Type
  ---     -
  1       192.168.1.1    00:19:cb:37:00:49  1     CPU     0       static
  2       192.168.1.99   00:c5:d8:01:23:45  1     3       0       static
  3       192.168.2.1    00:19:cb:37:00:49  465   CPU     0       static
sysname#

```

The following table describes the labels in this screen.

Table 14 show ip arp

| LABEL | DESCRIPTION |
|--------|--|
| Index | This field displays the index number. |
| IP | This field displays the learned IP address of the device. |
| MAC | This field displays the MAC address of the device. |
| VLAN | This field displays the VLAN to which the device belongs. |
| Port | This field displays the number of the port from which the IP address was learned. CPU indicates this IP address is the Switch's management IP address. |
| Age(s) | This field displays how long the entry remains valid. |
| Type | This field displays how the entry was learned. dynamic : The Switch learned this entry from ARP packets. |

ARP Inspection Commands

Use these commands to filter unauthorized ARP packets in your network.

7.1 Command Summary

The following section lists the commands for this feature.

Table 15 arp inspection Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| arp inspection | Enables ARP inspection on the Switch. You still have to enable ARP inspection on specific VLAN and specify trusted ports. | C | 13 |
| no arp inspection | Disables ARP inspection on the Switch. | C | 13 |
| show arp inspection | Displays ARP inspection configuration details. | E | 3 |
| clear arp inspection statistics | Removes all ARP inspection statistics on the Switch. | E | 3 |
| clear arp inspection statistics vlan <vlan-list> | Removes ARP inspection statistics for the specified VLAN(s). | E | 3 |
| show arp inspection statistics | Displays all ARP inspection statistics on the Switch. | E | 3 |
| show arp inspection statistics vlan <vlan-list> | Displays ARP inspection statistics for the specified VLAN(s). | E | 3 |

Table 16 Command Summary: arp inspection filter

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| show arp inspection filter [<mac-addr>] [vlan <vlan-id>] | Displays the current list of MAC address filters that were created because the Switch identified an unauthorized ARP packet. Optionally, lists MAC address filters based on the MAC address or VLAN ID in the filter. | E | 3 |
| no arp inspection filter <mac-addr> vlan <vlan-id> | Specifies the ARP inspection record you want to delete from the Switch. The ARP inspection record is identified by the MAC address and VLAN ID pair. | E | 13 |
| clear arp inspection filter | Delete all ARP inspection filters from the Switch. | E | 13 |
| arp inspection filter-aging-time <1-2147483647> | Specifies how long (1-2147483647 seconds) MAC address filters remain in the Switch after the Switch identifies an unauthorized ARP packet. The Switch automatically deletes the MAC address filter afterwards. | C | 13 |
| arp inspection filter-aging-time none | Specifies the MAC address filter to be permanent. | C | 13 |
| no arp inspection filter-aging-time | Resets how long (1-2147483647 seconds) the MAC address filter remains in the Switch after the Switch identifies an unauthorized ARP packet to the default value. | C | 13 |

Table 17 Command Summary: arp inspection log

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| show arp inspection log | Displays the log settings configured on the Switch. It also displays the log entries recorded on the Switch. | E | 3 |
| clear arp inspection log | Delete all ARP inspection log entries from the Switch. | E | 13 |
| arp inspection log-buffer entries <0-1024> | Specifies the maximum number (1-1024) of log messages that can be generated by ARP packets and not sent to the syslog server. If the number of log messages in the Switch exceeds this number, the Switch stops recording log messages and simply starts counting the number of entries that were dropped due to unavailable buffer. | C | 13 |
| arp inspection log-buffer logs <0-1024> interval <0-86400> | Specifies the number of syslog messages that can be sent to the syslog server in one batch and how often (1-86400 seconds) the Switch sends a batch of syslog messages to the syslog server. | C | 13 |
| no arp inspection log-buffer entries | Resets the maximum number (1-1024) of log messages that can be generated by ARP packets and not sent to the syslog server to the default value. | C | 13 |
| no arp inspection log-buffer logs | Resets the maximum number of syslog messages the Switch can send to the syslog server in one batch to the default value. | C | 13 |

Table 18 Command Summary: interface arp inspection

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| show arp inspection interface port-channel <port-list> | Displays the ARP inspection settings for the specified port(s). | E | 3 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |
| arp inspection trust | Sets the port to be a trusted port for arp inspection. The Switch does not discard ARP packets on trusted ports for any reason. | C | 13 |
| no arp inspection trust | Disables this port from being a trusted port for ARP inspection. | C | 13 |

Table 19 Command Summary: arp inspection vlan

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| show arp inspection vlan <vlan-list> | Displays ARP inspection settings for the specified VLAN(s). | E | 3 |
| arp inspection vlan <vlan-list> | Enables ARP inspection on the specified VLAN(s). | C | 13 |
| no arp inspection vlan <vlan-list> | Disables ARP inspection on the specified VLAN(s). | C | 13 |
| arp inspection vlan <vlan-list> logging [all none permit deny] | Enables logging of ARP inspection events on the specified VLAN(s). Optionally specifies which types of events to log. | C | 13 |
| no arp inspection vlan <vlan-list> logging | Disables logging of messages generated by ARP inspection for the specified VLAN(s). | C | 13 |

7.2 Command Examples

This example looks at the current list of MAC address filters that were created because the Switch identified an unauthorized ARP packet. When the Switch identifies an unauthorized ARP packet, it automatically creates a MAC address filter to block traffic from the source MAC address and source VLAN ID of the unauthorized ARP packet.

```

sysname# show arp inspection filter
  Filtering aging timeout : 300

      MacAddress  VLAN   Port  Expiry (sec)      Reason
  -----
Total number of bindings: 0

```

The following table describes the labels in this screen.

Table 20 show arp inspection filter

| LABEL | DESCRIPTION |
|-------------------------|---|
| Filtering aging timeout | This field displays how long the MAC address filters remain in the Switch after the Switch identifies an unauthorized ARP packet. The Switch automatically deletes the MAC address filter afterwards. |
| MacAddress | This field displays the source MAC address in the MAC address filter. |
| VLAN | This field displays the source VLAN ID in the MAC address filter. |
| Port | This field displays the source port of the discarded ARP packet. |
| Expiry (sec) | This field displays how long (in seconds) the MAC address filter remains in the Switch. You can also delete the record manually (Delete). |
| Reason | This field displays the reason the ARP packet was discarded. MAC+VLAN: The MAC address and VLAN ID were not in the binding table. IP: The MAC address and VLAN ID were in the binding table, but the IP address was not valid. Port: The MAC address, VLAN ID, and IP address were in the binding table, but the port number was not valid. |

This example looks at log messages that were generated by ARP packets and that have not been sent to the syslog server yet.

```

sysname# show arp inspection log
  Total Log Buffer Size : 32
  Syslog rate : 5 entries per 1 seconds

  Port  Vlan          Sender MAC          Sender IP  Pkts      Reason
   Time
  ----
Total number of logs: 0

```

The following table describes the labels in this screen.

Table 21 show arp inspection log

| LABEL | DESCRIPTION |
|-----------------------|--|
| Total Log Buffer Size | This field displays the maximum number (1-1024) of log messages that were generated by ARP packets and have not been sent to the syslog server yet. If the number of log messages in the Switch exceeds this number, the Switch stops recording log messages and simply starts counting the number of entries that were dropped due to unavailable buffer. |
| Syslog rate | This field displays the maximum number of syslog messages the Switch can send to the syslog server in one batch. This number is expressed as a rate because the batch frequency is determined by the Log Interval . |
| Port | This field displays the source port of the ARP packet. |
| Vlan | This field displays the source VLAN ID of the ARP packet. |
| Sender MAC | This field displays the source MAC address of the ARP packet. |
| Sender IP | This field displays the source IP address of the ARP packet. |
| Pkts | This field displays the number of ARP packets that were consolidated into this log message. The Switch consolidates identical log messages generated by ARP packets in the log consolidation interval into one log message. |
| Reason | This field displays the reason the log message was generated. dhcp deny : An ARP packet was discarded because it violated a dynamic binding with the same MAC address and VLAN ID. static deny : An ARP packet was discarded because it violated a static binding with the same MAC address and VLAN ID. deny : An ARP packet was discarded because there were no bindings with the same MAC address and VLAN ID. static permit : An ARP packet was forwarded because it matched a static binding. dhcp permit : An ARP packet was forwarded because it matched a dynamic binding. |
| Time | This field displays when the log message was generated. |
| Total number of logs | This field displays the number of log messages that were generated by ARP packets and that have not been sent to the syslog server yet. If one or more log messages are dropped due to unavailable buffer, there is an entry called overflow with the current number of dropped log messages. |

This example displays whether ports are trusted or untrusted ports for ARP inspection.

```

sysname# show arp inspection interface port-channel 1
Interface  Trusted State  Rate (pps)  Burst Interval
-----
          1      Untrusted    15          1

```

The following table describes the labels in this screen.

Table 22 show arp inspection interface port-channel

| LABEL | DESCRIPTION |
|----------------|---|
| Interface | This field displays the port number. If you configure the * port, the settings are applied to all of the ports. |
| Trusted State | This field displays whether this port is a trusted port (Trusted) or an untrusted port (Untrusted). Trusted ports are connected to DHCP servers or other switches, and the Switch discards DHCP packets from trusted ports only if the rate at which DHCP packets arrive is too high. |
| Rate (pps) | This field displays the maximum number for DHCP packets that the Switch receives from each port each second. The Switch discards any additional DHCP packets. |
| Burst Interval | This field displays the length of time over which the rate of ARP packets is monitored for each port. For example, if the Rate is 15 pps and the burst interval is 1 second, then the Switch accepts a maximum of 15 ARP packets in every one-second interval. If the burst interval is 5 seconds, then the Switch accepts a maximum of 75 ARP packets in every five-second interval. |

ARP Learning Commands

Use these commands to configure how the Switch updates the ARP table.

8.1 Command Summary

The following section lists the commands for this feature.

Table 23 arp-learning Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>arp-learning <arp-reply gratuitous-arp arp-request></code> | Sets the ARP learning mode the Switch uses on the port. <code>arp-reply</code> : the Switch updates the ARP table only with the ARP replies to the ARP requests sent by the Switch. <code>gratuitous-arp</code> : the Switch updates its ARP table with either an ARP reply or a gratuitous ARP request. A gratuitous ARP is an ARP request in which both the source and destination IP address fields are set to the IP address of the device that sends this request and the destination MAC address field is set to the broadcast address. <code>arp-request</code> : the Switch updates the ARP table with both ARP replies, gratuitous ARP requests and ARP requests. | C | 13 |
| <code>no arp-learning</code> | Resets the ARP learning mode to its default setting (<code>arp-reply</code>). | C | 13 |

8.2 Command Examples

This example changes the ARP learning mode on port 8 from `arp-reply` to `arp-request`.

```

sysname# configure
sysname(config)# interface port-channel 8
sysname(config-interface)# arp-learning arp-request

```

Bandwidth Commands

Use these commands to configure the maximum allowable bandwidth for incoming or outgoing traffic flows on a port.



Bandwidth management implementation differs across Switch models.

- Some models use a single command (`bandwidth-limit ingress`) to control the incoming rate of traffic on a port.
- Other models use two separate commands (`bandwidth-limit cir` and `bandwidth-limit pir`) to control the Committed Information Rate (CIR) and the Peak Information Rate (PIR) allowed on a port.

The CIR and PIR should be set for all ports that use the same uplink bandwidth. If the CIR is reached, packets are sent at the rate up to the PIR. When network congestion occurs, packets through the ingress port exceeding the CIR will be marked for drop.



The CIR should be less than the PIR.

See [Section 9.2 on page 38](#) and [Section 9.3 on page 39](#) for examples.

See also [Chapter 87 on page 309](#) for information on how to use trTCM (Two Rate Three Color Marker) to control traffic flow.

9.1 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 24 User-input Values: running-config

| COMMAND | DESCRIPTION |
|------------------|--|
| <i>port-list</i> | The port number or a range of port numbers that you want to configure. |
| <i>rate</i> | The rate represents a bandwidth limit. Different models support different rate limiting incremental steps. See your User's Guide for more information. |

The following section lists the commands for this feature.

Table 25 Command Summary: bandwidth-control & bandwidth-limit

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>show interfaces config <port-list> bandwidth-control</code> | Displays the current settings for interface bandwidth control. | E | 3 |
| <code>bandwidth-control</code> | Enables bandwidth control on the Switch. | C | 13 |
| <code>no bandwidth-control</code> | Disables bandwidth control on the Switch. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters subcommand mode for configuring the specified ports. | C | 13 |
| <code>bandwidth-limit ingress</code> | Enables bandwidth limits for incoming traffic on the port(s). | C | 13 |
| <code>bandwidth-limit ingress <rate></code> | Sets the maximum bandwidth allowed for incoming traffic on the port(s). | C | 13 |
| <code>bandwidth-limit egress</code> | Enables bandwidth limits for outgoing traffic on the port(s). | C | 13 |
| <code>bandwidth-limit egress <rate></code> | Sets the maximum bandwidth allowed for outgoing traffic on the port(s). | C | 13 |
| <code>no bandwidth-limit ingress</code> | Disables ingress bandwidth limits on the specified port(s). | C | 13 |
| <code>no bandwidth-limit egress</code> | Disables egress bandwidth limits on the specified port(s). | C | 13 |
| <code>bandwidth-limit cir</code> | Enables commit rate limits on the specified port(s). | C | 13 |
| <code>bandwidth-limit cir <rate></code> | Sets the guaranteed bandwidth allowed for the incoming traffic flow on a port. The commit rate should be less than the peak rate. The sum of commit rates cannot be greater than or equal to the uplink bandwidth. Note: The sum of CIRs cannot be greater than or equal to the uplink bandwidth. | C | 13 |
| <code>bandwidth-limit pir</code> | Enables peak rate limits on the specified port(s). | C | 13 |
| <code>bandwidth-limit pir <rate></code> | Sets the maximum bandwidth allowed for the incoming traffic flow on the specified port(s). | C | 13 |
| <code>no bandwidth-limit cir</code> | Disables commit rate limits on the specified port(s). | C | 13 |
| <code>no bandwidth-limit pir</code> | Disables peak rate limits on the specified port(s). | C | 13 |

9.2 Command Examples: ingress

This example sets the outgoing traffic bandwidth limit to 5000 Kbps and the incoming traffic bandwidth limit to 4000 Kbps for port 1.

```

sysname# configure
sysname(config)# bandwidth-control
sysname(config)# interface port-channel 1
sysname(config-interface)# bandwidth-limit egress 5000
sysname(config-interface)# bandwidth-limit ingress 4000
sysname(config-interface)# exit
sysname(config)# exit

```

This example deactivates the outgoing bandwidth limit on port 1.

```
sysname# configure
sysname(config)# interface port-channel 1
sysname(config-interface)# no bandwidth-limit egress
sysname(config-interface)# exit
sysname(config)# exit
```

9.3 Command Examples: cir & pir

This example sets the guaranteed traffic bandwidth limit on port 1 to 4000 Kbps and the maximum traffic bandwidth limit to 5000 Kbps for port 1.

```
sysname# configure
sysname(config)# bandwidth-control
sysname(config)# interface port-channel 1
sysname(config-interface)# bandwidth-limit cir
sysname(config-interface)# bandwidth-limit cir 4000
sysname(config-interface)# bandwidth-limit pir
sysname(config-interface)# bandwidth-limit pir 5000
sysname(config-interface)# exit
sysname(config)# exit
```

This example displays the bandwidth limits configured on port 1.

```
sysname# show running-config interface port-channel 1 bandwidth-limit
Building configuration...

Current configuration:

interface port-channel 1
 bandwidth-limit cir 4000
 bandwidth-limit cir
 bandwidth-limit pir 5000
 bandwidth-limit pir
```

BPDU Guard

Use these commands to configure BPDU guard on the Switch.

10.1 BPDU Guard Overview

A BPDU (Bridge Protocol Data Units) is a data frame that contains information about STP. STP-aware switches exchange BPDUs periodically.

The BPDU guard feature allows you to prevent any new STP-aware switch from connecting to an existing network and causing STP topology changes in the network. If there is any BPDU detected on the port(s) on which BPDU guard is enabled, the Switch disables the port(s) automatically. You can then enable the port(s) manually via the web configurator or the commands. With error-disable recovery, you can also have the port(s) become active after a certain time interval.

10.2 Command Summary

The following section lists the commands for this feature.

Table 26 bpduguard Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>bpduguard</code> | Enabled BPDU guard on the Switch. | C | 13 |
| <code>no bpduguard</code> | Disables BPDU guard on the Switch. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>bpduguard</code> | Enabled BPDU guard on the port(s). | C | 13 |
| <code>no bpduguard</code> | Disables BPDU guard on the port(s). | C | 13 |
| <code>show bpduguard</code> | Displays whether BPDU guard is enabled on the Switch and the port status. | E | 3 |

Broadcast Storm Commands

Use these commands to limit the number of broadcast, multicast and destination lookup failure (DLF) packets the Switch receives per second on the ports.



Broadcast storm control implementation differs across Switch models.

- Some models use a single command (`bmstorm-limit`) to control the combined rate of broadcast, multicast and DLF packets accepted on Switch ports.
- Other models use three separate commands (`broadcast-limit`, `multicast-limit`, `dlf-limit`) to control the number of individual types of packets accepted on Switch ports.

See [Section 11.2 on page 42](#) and [Section 11.3 on page 42](#) for examples.

11.1 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 27 User-input Values: broadcast-limit, multicast-limit & dlf-limit

| COMMAND | DESCRIPTION |
|--------------|---|
| <i>pkt/s</i> | Specifies the maximum number of packets per second accepted by a Switch port. |

The following section lists the commands for this feature.

Table 28 Command Summary: storm-control, bmstorm-limit, and bstorm-control

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show interfaces config <port-list> bstorm-control</code> | Displays the current settings for broadcast storm control. | E | 3 |
| <code>storm-control</code> | Enables broadcast storm control on the Switch. | C | 13 |
| <code>no storm-control</code> | Disables broadcast storm control on the Switch. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters subcommand mode for configuring the specified ports. | C | 13 |
| <code>bmstorm-limit</code> | Enables broadcast storm control on the specified port(s). | C | 13 |

Table 28 Command Summary: storm-control, bmstorm-limit, and bstorm-control (continued)

| COMMAND | DESCRIPTION | M | P |
|-------------------------|---|---|----|
| bmstorm-limit <rate> | Specifies the maximum rate at which the Switch receives broadcast, multicast, and destination lookup failure (DLF) packets on the specified port(s). Different models support different rate limiting incremental steps. See your User's Guide for more information. | C | 13 |
| no bmstorm-limit | Disables broadcast storm control on the specified port(s). | C | 13 |
| broadcast-limit | Enables the broadcast packet limit on the specified port(s). | C | 13 |
| broadcast-limit <pkt/s> | Specifies the maximum number of broadcast packets the Switch accepts per second on the specified port(s). | C | 13 |
| no broadcast-limit | Disables broadcast packet limit no the specified port(s). | C | 13 |
| multicast-limit | Enables the multicast packet limit on the specified port(s). | C | 13 |
| multicast-limit <pkt/s> | Specifies the maximum number of multicast packets the Switch accepts per second on the specified port(s). | C | 13 |
| no multicast-limit | Disables multicast packet limit on the specified port(s). | C | 13 |
| dlf-limit | Enables the DLF packet limit on the specified port(s). | C | 13 |
| dlf-limit <pkt/s> | Specifies the maximum number of DLF packets the Switch accepts per second on the specified port(s). | C | 13 |
| no dlf-limit | Disables DLF packet limits no the specified port(s). | C | 13 |

11.2 Command Example: bmstorm-limit

This example enables broadcast storm control on port **1** and limits the combined maximum rate of broadcast, multicast and DLF packets to **128 Kbps**.

```

sysname# configure
sysname(config)# storm-control
sysname(config)# interface port-channel 1
sysname(config-interface)# bmstorm-limit
sysname(config-interface)# bmstorm-limit 128
sysname(config-interface)# exit
sysname(config)# exit

```

11.3 Command Example: broadcast-limit, multicast-limit & dlf-limit

This example enables broadcast storm control on the Switch, and configures port **1** to accept up to:

- **128** broadcast packets per second,
- **256** multicast packets per second,

- **64** DLF packets per second.

```
sysname# configure
sysname(config)# storm-control
sysname(config)# interface port-channel 1
sysname(config-interface)# broadcast-limit
sysname(config-interface)# broadcast-limit 128
sysname(config-interface)# multicast-limit
sysname(config-interface)# multicast-limit 256
sysname(config-interface)# dlf-limit
sysname(config-interface)# dlf-limit 64
sysname(config)# exit
sysname# show interfaces config 1 bstorm-control
Broadcast Storm Control Enabled: Yes
```

| Port | Broadcast | Enabled | Multicast | Enabled | DLF-Limit | Enabled |
|------|-----------|---------|-----------|---------|-----------|---------|
| 1 | 128 pkt/s | Yes | 256 pkt/s | Yes | 64 pkt/s | Yes |

CFM Commands

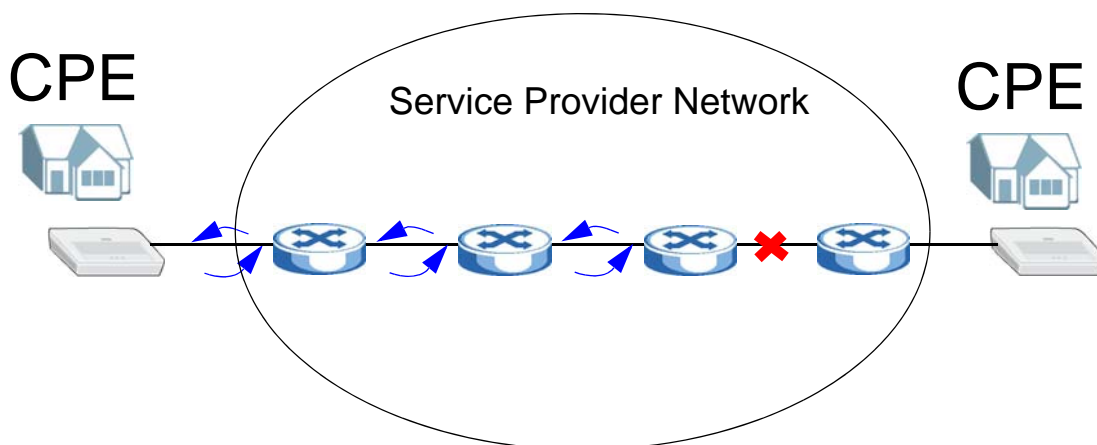
Use these commands to configure the Connectivity Fault Management (CFM) on the Switch.

12.1 CFM Overview

The route between two users may go through aggregated switches, routers and/or DSLAMs owned by independent organizations. A connectivity fault point generally takes time to discover and impacts subscribers' network access. IEEE 802.1ag is a Connectivity Fault Management (CFM) specification which allows network administrators to identify and manage connection faults in order to ease management and maintenance. Through discovery and verification of the path, CFM can detect and analyze connectivity faults in bridged LANs.

The figure shown below is an example of a connection fault between switches in the service provider's network. CFM can be used to identify and management this kind of connection problem.

Figure 1 Connectivity Fault Example



12.1.1 How CFM Works

CFM sends pro-active Connectivity Check (CC) packets between two CFM-aware devices in the same MD (Maintenance Domain) network. An MA (Maintenance Association) defines a VLAN and associated ports on the device under an MD level. In this MA, a port can be an MEP (Maintenance End Point) port or an MIP (Maintenance Intermediate Point) port.

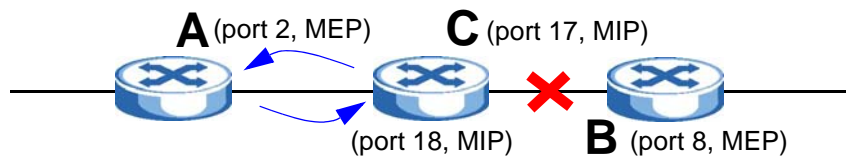
- MEP port - has the ability to send pro-active connectivity check (CC) packets and get other MEP port information from neighbor switches' CC packets within an MA.
- MIP port - only forwards the CC packets.

CFM provides two tests to discover connectivity faults.

- Loopback test - similar to using “ping” in Microsoft DOS mode to check connectivity from your computer to a host. In a loopback test, a MEP port sends a LBM (Loop Back Message) to a MIP port and checks for an LBR (Loop Back Response). If no response is received, there might be a connectivity fault between them.
- Link trace test - similar to using “tracert” in the Microsoft DOS mode to check connectivity from your computer to a host. A link trace test provides additional connectivity fault analysis to get more information on where the fault is. In a link trace test, a MEP port sends a LTM (Link Trace Message) to a MIP port and checks for an LTR (Link Trace Response). If an MIP or MEP port does not respond to the source MEP, this may indicate a fault. Administrators can take further action to check the fault and resume services according to the line connectivity status report.

An example is shown next. A user cannot access the Internet. To check the problem, the administrator starts the link trace test from **A** which is an MEP port to **B** which is also an MEP port. Each aggregation MIP port between aggregated devices responds to the LTM packets and also forwards them to the next port. A fault occurs at port **C**. **A** discovers the fault since it only gets the LTR packets from the ports before port **C**.

Figure 2 MIP and MEP Example



12.2 CFM Term Definition

This section lists the common term definition which appears in this chapter. Refer to User's Guide for more detailed information about CFM.

Table 29 CFM Term Definitions

| TERM | DESCRIPTION |
|------|---|
| CFM | CFM (Connectivity Fault Management) is used to detect and analyze connectivity faults in bridged LANs. |
| MD | An MD (Maintenance Domain) is part of a network, where CFM can be done. The MD is identified by a level number and contains both MEPs and MIPs. The Switch supports up to eight MD levels (0 ~ 7) in a network. You can create multiple MDs on one MD level and multiple MA groups in one MD. |
| MA | An MA (Maintenance Association) is a group of MEPs and identified by a VLAN ID. One MA should belong to one and only one MD group. |

Table 29 CFM Term Definitions

| TERM | DESCRIPTION |
|--------------------|--|
| MEP | An MEP (Maintenance End Point) port has the ability to send and reply to the CCMs, LBMs and LTMs. It also gets other MEP port information from neighbor switches' CCMs in an MA. |
| MIP | An MIP (Maintenance Intermediate Point) port forwards the CCMs, LBMs, and LTMs and replies the LBMs and LTMs by sending Loop Back Responses (LBRs) and Link Trace Responses (LTRs). |
| Connectivity Check | Connectivity Check (CC) enables an MEP port sending Connectivity Check Messages (CCMs) periodically to other MEP ports. An MEP port collects CCMs to get other MEP information within an MA. |
| Loop Back Test | Loop Back Test (LBT) checks if an MEP port receives its LBR (Loop Back Response) from its target after it sends the LBM (Loop Back Message). If no response is received, there might be a connectivity fault between them. |
| Link Trace Test | Link Trace Test (LTT) provides additional connectivity fault analysis to get more information on where the fault is. In the link trace test, MIP ports also send LTR (Link Trace Response) to response the source MEP port's LTM (Link Trace Message). If an MIP or MEP port does not respond to the source MEP, this may indicate a fault. Administrators can take further action to check and resume services from the fault according to the line connectivity status report. |

12.3 User Input Values

This section lists the common term definition appears in this chapter. Refer to User's Guide for more detailed information about CFM.

Table 30 CFM command user input values

| USER INPUT | DESCRIPTION |
|--------------------|---|
| <i>mep-id</i> | This is the maintenance endpoint identifier (1~8191). |
| <i>ma-index</i> | This is the maintenance association (MA) index number (1~4294967295). |
| <i>md-index</i> | This is the maintenance domain (MD) index number (1~4294967295). |
| <i>mac-address</i> | This is the remote maintenance endpoint's MAC address or a virtual MAC address assigned to a port. A Switch has one or two MAC addresses only. If you do not use virtual MAC addresses with CFM, all CFM ports will use the Switch's MAC address and appear as one port. If you want unique CFM ports, you need to assign virtual MAC addresses. If you use virtual MAC addresses, make sure that all virtual MAC addresses are unique in both the Switch and the network to which it belongs. |

12.4 Command Summary

The following section lists the commands for this feature.

Table 31 CFM Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>clear ethernet cfm linktrace</code> | Clears the link trace database. | E | 13 |
| <code>clear ethernet cfm mep-ccmdb</code> | Clears the MEP CCM database. | E | 13 |
| <code>clear ethernet cfm mip-ccmdb</code> | Clears the MIP CCM database. | E | 13 |
| <code>clear ethernet cfm mep-defects</code> | Clears the MEP-defects database. | E | 13 |
| <code>ethernet cfm</code> | Enables CFM on the Switch. | C | 13 |
| <code>ethernet cfm loopback remote-mep <mep-id> mep <mep-id> ma <ma-index> md <md-index> [size <0-1500>] [count <1-1024>]</code> | Specifies the remote MEP ID, local MEP ID, MA index and MD index to perform a loopback test. This enables the MEP port (with the specified MEP ID) in a specified CFM domain to send the LBMs (Loop Back Messages) to a specified remote end point. You can also define the packet size (from 0 to 1500 bytes) and how many times the Switch sends the LBMs. | E | 13 |
| <code>ethernet cfm loopback mac <mac-address> mep <mep-id> ma <ma-index> md <md-index> [size <0-1500>] [count <1-1024>]</code> | Specifies the destination MAC address, local MEP ID, MA index and MD index to perform a loopback test. This enables the MEP port (with the specified MEP ID) in a specified CFM domain to send the LBMs (Loop Back Messages) to a specified remote end point. You can also define the packet size (from 0 to 1500 bytes) and how many times the Switch sends the LBMs. | E | 13 |
| <code>ethernet cfm linktrace remote-mep <mep-id> mep <mep-id> ma <ma-index> md <md-index> [mip-ccmdb] [[ttl <ttl>]</code> | Specifies the remote MEP ID, local MEP ID, MA index and MD index to perform a link trace test. This enables the MEP port (with the specified MEP ID) in a specified CFM domain to send the LTMs (Link Trace Messages) to a specified remote end point. <i>mip-ccmdb</i> : Specifies the MIP CCM DB, a database that stores information (tuples of {Port, VID, MAC address}) about MEPs in the MD when receiving CCMs. The MIP CCM DB is used for fault isolation, such as link trace and loop back. An entry can remain in the MIP CCM DB for at least 24 hours. <i>ttl</i> : This is the time-to-live value (the number of transmissions, 64 hops by default). Sets this to stop a test once it exceeds the time duration without receiving any response. | E | 13 |
| <code>ethernet cfm linktrace mac <mac-address> mep <mep-id> ma <ma-index> md <md-index> [mip-ccmdb] [[ttl <ttl>]</code> | Specifies the destination MAC address, local MEP ID, MA index and MD index to perform a link trace test. This enables the MEP port (with the specified MEP ID) in a specified CFM domain to send the LTMs (Link Trace Messages) to a specified remote end point. <i>mip-ccmdb</i> : Specifies the MIP CCM DB, a database that stores information (tuples of {Port, VID, MAC address}) about MEPs in the MD when receiving CCMs. The MIP CCM DB is used for fault isolation, such as link trace and loop back. An entry can remain in the MIP CCM DB for at least 24 hours. <i>ttl</i> : This is the time-to-live value (the number of transmissions, 64 hops by default). Sets this to stop a test once it exceeds the time duration without receiving any response. | E | 13 |

Table 31 CFM Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <pre>ethernet cfm ma <ma-index> format <vid string integer> name <ma-name> md <md-index> primary-vlan <1-4094></pre> | <p>Creates an MA (Maintenance Association) and defines its VLAN ID under the MD. You can also define the format which the Switch uses to send this MA information in the domain (MD).</p> <p><i>ma-name</i>: Enters a VLAN ID, a descriptive name or a 2-octet integer for the MA.</p> <p>Note: If you set the <i>format</i> to <i>vid</i>, the VLAN ID should be the same as the VLAN ID you use to identify the MA.</p> | C | 13 |
| <pre>cc-interval <100ms 1s 10s 1min 10min></pre> | Sets how often an MEP sends a connectivity check message (CCM). | C | 13 |
| <pre>mhf-creation < none default explicit></pre> | <p>Sets MHF (MIP Half Function).</p> <p>Select <i>none</i> and no MIP can be created automatically for this MA.</p> <p>Select <i>default</i> to automatically create MIPs for this MA and on the ports belonging to this MA's VLAN when there are no lower configured MD levels or there is an MEP at the next lower configured MD level on the port.</p> <p>Select <i>explicit</i> to automatically create MIPs for this MA and on the ports belonging to this MA's VLAN only when there is an MEP at the next lower configured MD level on the port.</p> | C | 13 |
| <pre>id-permission < none chassis management chassis- management></pre> | <p>Sets what's to be included in the sender ID TLV (Type-Length-Value) transmitted by CFM packets.</p> <p>Select <i>none</i> to not include the sender ID TLV.</p> <p>Select <i>chassis</i> to include the chassis information.</p> <p>Select <i>management</i> to include the management information.</p> <p>Select <i>chassis-management</i> to include both chassis and management information.</p> | C | 13 |
| <pre>exit</pre> | Exits from the config-ma mode. | C | 13 |
| <pre>remote-mep <mep-id></pre> | Sets a remote MEP in an MA. | C | 13 |
| <pre>mep <mep-id> interface port- channel <port> direction <up down> priority <0-7></pre> | <p>Sets an MEP in an MA.</p> <p><i>up down</i>: The traffic direction.</p> <p><i>0-7</i>: The priority value of the CCMs or LTMs transmitted by the MEP. 1 is the lowest, then 2, 0 and 3 ~ 7.</p> | C | 13 |
| <pre>mep <mep-id> interface port- channel <port> direction <up down> priority <0-7> inactive</pre> | Disables a specified MEP. | C | 13 |
| <pre>mep <mep-id> interface port- channel <port> direction <up down> priority <0-7> cc- enable</pre> | Enables Connectivity Check (CC) to allow an MEP sending Connectivity Check Messages (CCMs) periodically to other MEPs. | C | 13 |
| <pre>no remote-mep <mep-id></pre> | Deletes a specified destination MEP. | C | 13 |
| <pre>no mep <mep-id></pre> | Deletes a specified MEP. | C | 13 |
| <pre>no mep <mep-id> inactive</pre> | Enables an MEP. | C | 13 |
| <pre>no mep <mep-id> cc-enable</pre> | Disallows an MEP sending Connectivity Check Messages (CCMs) periodically to other MEPs. | C | 13 |

Table 31 CFM Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>ethernet cfm md <md-index> format <dns mac string> name <md-name> level <0-7></code> | Creates an MD (Maintenance Domain) with the specified name and level number. <i>md-name</i> : Enters a domain name, MAC address or a descriptive name for the MD. | C | 13 |
| <code>ethernet cfm management-address-domain ip [<ip-addr>]</code> | Sets the Switch to carry the host name and management IP address for the VLAN to which an MEP belongs or the specified IP address in CFM packets. This helps you to easily identify a remote MEP by its host name and management IP address showed in the link trace database and MEP-CCM database. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for configuring the specified port(s). | C | 13 |
| <code>ethernet cfm virtual-mac <mac-addr></code> | Assigns a virtual MAC address(es) to the specified port(s) so that each specified port can have its own MAC address for CFM. You cannot use the <code>copy running-config interface port-channel</code> command to copy the virtual MAC address from the specified port to other ports. | C | 13 |
| <code>no ethernet cfm virtual-mac</code> | Removes the virtual MAC address(es) and sets the port(s) to use the default system MAC address. | C | 13 |
| <code>no ethernet cfm</code> | Disables CFM on the Switch. | C | 13 |
| <code>no ethernet cfm md <md-index></code> | Deletes the specified MD. | C | 13 |
| <code>no ethernet cfm ma <ma-index> md <md-index></code> | Deletes an MA from the specified MD. | C | 13 |
| <code>no ethernet cfm management-address-domain</code> | Sets the Switch to not carry the host name and management IP address in CFM packets. | C | 13 |
| <code>show ethernet cfm linktrace</code> | Displays the CFM link trace database information. | E | 13 |
| <code>show ethernet cfm local</code> | Displays the detailed settings of the configured MD(s) and MA(s). | E | 13 |
| <code>show ethernet cfm local stack</code> | Displays a list of all maintenance points, such as MIP and MEP. | E | 13 |
| <code>show ethernet cfm local stack mep</code> | Displays a list of the MEP(s). | E | 13 |
| <code>show ethernet cfm local stack mep <mep-id> ma <ma-index> md <md-index></code> | Displays the specified MEP's general, fault notification generator, continuity-check, loopback and link trace information. | E | 13 |
| <code>show ethernet cfm local stack mep <mep-id> ma <ma-index> md <md-index> mep-ccmdb [remote-mep <mep-id>]</code> | Displays the specified MEP's MEP-CCM database information. Each MEP maintains an MEP CCM database which stores information about remote MEPs in the MA when receiving CCMs. | E | 13 |
| <code>show ethernet cfm local stack mip</code> | Displays a list of the MIP(s). | E | 13 |
| <code>show ethernet cfm local stack mip mip-ccmdb</code> | Displays the MIP-CCM database. | E | 13 |
| <code>show ethernet cfm remote</code> | Displays a list of MA(s), MEP(s) and the remote MEP(s) under the configured MD(s). | E | 13 |
| <code>show ethernet cfm virtual-mac</code> | Displays all virtual MAC addresses. | E | 13 |
| <code>show ethernet cfm virtual-mac port <port-list></code> | Displays the MAC address(es) of the specified port(s). | E | 13 |

12.5 Command Examples

This example creates **MD1** (with MD index 1 and level 1) and **MA2** (with MA index 2 and VLAN ID 2) under **MD1** that defines a CFM domain.

```
sysname# config
sysname(config)# ethernet cfm md 1 format string name MD1 level 1
sysname(config)# ethernet cfm ma 2 format string name MA2 md 1 primary-
vlan 2
sysname(config-ma)# exit
sysname(config)# exit
sysname# write memory
```



Remember to save new settings using the `write memory` command.

This example deletes **MA2** (with MA index 2) from **MD1** (with MD index 1).

```
sysname# config
sysname(config)# no ethernet cfm ma 2 md 1
sysname(config)# exit
sysname# write mem
```

This example creates **MA3** (with MA index 3 and VLAN ID 123) under **MD1**, and associates port 1 as an MEP port with MEP ID 301 in the specified CFM domain. This also sets MHF (MIP half function) to **default** to have the Switch automatically create MIPs for this MA and on the ports belonging to this MA's VLAN when there are no lower configured MD levels or there is a MEP at the next lower configured MD level on the port. This also sets a remote MEP in **MA3**.

```
sysname# config
sysname(config)# ethernet cfm ma 3 format string name MA3 md 1 primary-vlan
123
sysname(config-ma)# mep 301 interface port-channel 1 direction up priority 2
sysname(config-ma)# mep 301 interface port-channel 1 direction up priority 2
cc-enable
sysname(config-ma)# mhf-creation default
sysname(config-ma)# remote-mep 117
sysname(config-ma)# exit
sysname(config)# exit
sysname# write mem
```

This example lists all CFM domains. In this example, only one MD (**MD1**) is configured. The **MA3** with the associated MEP port 1 is under this **MD1**.

```

sysname# show ethernet cfm local
MD Index: 1
  MD Name: MD1(string)
  MD Level: 1
    MA Index: 3
      MA Name:          MA3(string)
      Primary Vlan:    123
      CC Interval:     1000 millisecond(s)
      MHF Creation:    default
      ID Permission:   none
      MEP:301 (ACTIVE ) Port:1   Direction:DOWN Priority:5 CC-Enable:FALSE
sysname#

```

This example starts a loopback test and displays the test result on the console.

```

sysname# ethernet cfm loopback remote-mep 2 mep 1 ma 1 md 1
Sending 5 Ethernet CFM Loopback messages to remote-mepid 2, timeout is 5
seconds .....
sysname# Loopback: Successful
Success rate is 100 percent, round-trip min/avg/max = 0/0/0 ms
sysname#

```

This example displays all neighbors' MEP port information in the MIP-CCM databases.

```

sysname# show ethernet cfm local stack mip mip-ccmdb
MIP CCM DB
Port  VID      Source Address      Retained
-----
  2    1    00:19:cb:00:00:04    0 hr(s)
  7    1    00:19:cb:00:00:06    0 hr(s)
sysname#

```

The following table describes the labels in this screen.

Table 32 show cfm-action mipccmdb

| LABEL | DESCRIPTION |
|----------------|---|
| Port | Displays the number of the port on which this CCM was received. |
| VID | Displays the MA VLAN ID of the last received CCM. |
| Source Address | Displays the MAC address of the remote MEP. |
| Retained | Displays how long an entry has been kept in the database. |

This example assigns a virtual MAC address to port 3 and displays the MAC addresses of the ports 2 ~ 4. The assigned virtual MAC address should be unique in both the Switch and the network to which it belongs.

```
sysname# config
sysname(config)# interface port-channel 3
sysname(config-interface)# ethernet cfm virtual-mac 00:19:cb:12:34:56
sysname(config-interface)# exit
sysname(config)# exit
sysname# show ethernet cfm virtual-mac port 2-4
Virtual MACPort MAC
-----
2      00:19:cb:00:00:02
3      00:19:cb:12:34:56
4      00:19:cb:00:00:02
sysname#
```

This example sets the Switch to carry its host name and management IP address 192.168.100.1 in CFM packets.

```
sysname# config
sysname(config)# ethernet cfm management-address-domain ip 192.168.100.1
```

This example shows remote MEP database information. The remote MEP has been configured to carry its host name and a specified IP address in CFM packets.

```
sysnam# show ethernet cfm remote
MD Index: 1
  MD Name: customer123(string)
  MD Level: 2
  MA Index: 1
    MA Name: 123(vid)
    Primary Vlan: 123
    MEP: 11
      Remote MEP ID: 1
      MAC Address: 00:19:cb:6f:91:5a
      Chassis Id: MGS-3712F
      Management Address: 192.168.100.1:161
sysname#
```

Classifier Commands

Use these commands to classify packets into traffic flows. After classifying traffic, `policy` commands ([Chapter 58 on page 223](#)) can be used to ensure that a traffic flow gets the requested treatment in the network.

13.1 Command Summary

The following section lists the commands for this feature.

Table 33 Command Summary: classifier

| COMMAND | DESCRIPTION | M | P |
|--|--|---|---|
| <code>show classifier [<name>]</code> | Displays classifier configuration details. | E | 3 |
| <code>clear classifier match-count [<name>]</code> | Removes the number of times all or the specified classifier rule is applied. | E | 3 |

Table 33 Command Summary: classifier (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <pre>classifier <name> < [weight <0-65535>] [packet-format <802.3untag 802.3tag EtherIItag EtherIItag>] [priority <0-7>] [inner- priority <0-7>] [vlan <vlan- id>] [inner-vlan <vlan-id-list>] [ethernet-type <ether- num ip ipx arp rarp appletalk d ecnet IPv6>] [source-mac <src- mac-addr> [mask <mask>]] [source-port <port-list>] [source-trunk <trunk-list>] [destination-port <port-list>] [destination-mac <dest-mac- addr> [mask <mask>]] [ip-packet- length <0-65535> to <0-65525>] [dscp <0-63>] [precedence <0-7>] [tos <0-255>] [ipv6-dscp <0-63>] [ip-protocol <protocol- num tcp udp icmp egp ospf rsvp igmp igp pim ipsec> [establish-only]] [ipv6-next- header <protocol- num tcp udp icmpv6> [establish- only]] [source-ip <src-ip-addr> [mask-bits <mask-bits>]] [ipv6- source-ip <src-ipv6-addr> [prefix-length <prefix-length>]] [source-socket <socket-num> [to <socket-num>]]] [destination-ip <dest-ip-addr> [mask-bits <mask-bits>]] [ipv6- destination-ip <dest-ipv6-addr> [prefix-length <prefix-length>]] [destination-socket <socket- num> [to <socket-num>]]] [time- range <name>] [log] [count] [inactive]></pre> | <p>Configures a classifier. Specify the parameters to identify the traffic flow:</p> <p>weight: Enter the weight the priority of the Classifier rule when the match order is in manual mode. A higher weight means a higher priority.</p> <p>priority: Type 0 to classify traffic from any priority level or type a priority level with 1 being the highest priority.</p> <p>inner-priority: Type 0 to classify traffic from any inner priority level or type a priority level with 1 being the highest priority.</p> <p>vlan-id: Type 0 to classify traffic from any VLAN or type a specific VLAN ID number.</p> <p>inner-vlan-id: Type 0 to classify traffic from any inner VLAN or type a specific inner VLAN ID number.</p> <p>ethernet-type: Enter one of the Ethernet types or type the hexadecimal number that identifies an Ethernet type (see Table 34 on page 55).</p> <p>source-mac: Enter the source MAC address of the packet.</p> <p>source-port: Enter any to classify traffic received on any port or type a specific port number.</p> <p>source-trunk: Enter any to classify traffic from any trunk group or type a specific trunk group ID number.</p> <p>destination-port: Enter any to classify traffic to any destination port or type a specific port number.</p> <p>destination-mac: Enter the destination MAC address of the packet.</p> <p>ip-protocol: Enter one of the protocols or type the port number that identifies the protocol (see Table 35 on page 55).</p> <p>mask : type the mask for the specified MAC address to determine which bits a packet's MAC address should match. Enter "f" for each bit of the specified MAC address that the traffic's MAC address should match. Enter "0" for the bit(s) of the matched traffic's MAC address, which can be of any hexadecimal character(s). For example, if you set the MAC address to 00:13:49:00:00:00 and the mask to ff:ff:ff:00:00:00, a packet with a MAC address of 00:13:49:12:34:56 matches this criteria.</p> <p>tos: Enter any to classify traffic from any ToS, or set an IP Precedence (the first 3 bits of of the 8-bit ToS field) value and a Type of Service (the last 5 bits of the 8-bit ToS field) value.</p> <p>establish-only: Enter this to identify only TCP packets used to establish TCP connections.</p> <p>source-ip: Enter the source IPv4 address of the packet.</p> <p>ipv6-source-ip: Enter the source IPv6 address of the packet.</p> <p>source-socket: (for UDP or TCP protocols only) Specify the protocol port number.</p> <p>destination-ip: Enter the destination IPv4 address of the packet.</p> <p>ipv6-destination-ip: Enter the destination IPv6 address of the packet.</p> <p>destination-socket: (for UDP or TCP protocols only) specify the protocol port number.</p> <p>time-range: Enter the name of a pre-defined time-range rule.</p> <p>inactive: Disables this classifier.</p> | C | 13 |

Table 33 Command Summary: classifier (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>no classifier <name></code> | Deletes the classifier. If you delete a classifier you cannot use policy rule related information. | C | 13 |
| <code>no classifier <name> inactive</code> | Enables a classifier. | C | 13 |
| <code>classifier match-order <auto/manual></code> | Use <i>manual</i> to have classifier rules applied according to the weight of each rule you configured. Use <i>auto</i> to have classifier rules applied according to the layer of the item configured in the rule. | C | 13 |
| <code>classifier logging</code> | Creates a log when packets match a classifier rule during a defined time interval. | C | 13 |
| <code>classifier logging interval <0-65535></code> | Enter the length of the time period (in seconds) to count matched packets for a classifier rule. Enter an integer from 0-65535. 0 means that no logging is done. | C | 13 |
| <code>no classifier logging</code> | Disallows the Switch to create a log message when packets match a classifier rule during a defined time interval. | C | 13 |

The following table shows some other common Ethernet types and the corresponding protocol number.

Table 34 Common Ethernet Types and Protocol Number

| ETHERNET TYPE | PROTOCOL NUMBER |
|----------------|-----------------|
| IP ETHII | 0800 |
| X.75 Internet | 0801 |
| NBS Internet | 0802 |
| ECMA Internet | 0803 |
| Chaosnet | 0804 |
| X.25 Level 3 | 0805 |
| XNS Compat | 0807 |
| Banyan Systems | 0BAD |
| BBN Simnet | 5208 |
| IBM SNA | 80D5 |
| AppleTalk AARP | 80F3 |

In an IPv4 packet header, the “Protocol” field identifies the next level protocol. The following table shows some common IPv4 protocol types and the corresponding protocol number. Refer to <http://www.iana.org/assignments/protocol-numbers> for a complete list.

Table 35 Common IPv4 Protocol Types and Protocol Numbers

| PROTOCOL TYPE | PROTOCOL NUMBER |
|---------------|-----------------|
| ICMP | 1 |
| TCP | 6 |
| UDP | 17 |
| EGP | 8 |
| L2TP | 115 |

13.2 Command Examples

This example creates a classifier for packets with a VLAN ID of 3. The resulting traffic flow is identified by the name **VLAN3**. The `policy` command can use the name **VLAN3** to apply policy rules to this traffic flow. See the policy example in [Chapter 58 on page 223](#).

```

sysname# config
sysname(config)# classifier VLAN3 vlan 3
sysname(config)# exit
sysname# show classifier
Index Active Name           Rule
   1 Yes   VLAN3                     VLAN = 3;

```

This example creates a classifier (**Class1**) for packets which have a source MAC address of 11:22:33:45:67:89 and are received on port 1. You can then use the `policy` command and the name **Class1** to apply policy rules to this traffic flow. See the policy example in [Chapter 58 on page 223](#).

```

sysname# config
sysname(config)# classifier Class1 source-mac 11:22:33:45:67:89 source-port
1
sysname(config)# exit
sysname# show classifier
Index Active Name           Rule
   1 Yes   Class1                     SrcMac = 11:22:33:45:67:89; S...

```

The default value of `match-order` is `auto`. Use the following command to make `weight` work by changing the default value of `match-order` to `manual` and configuring a classifier weight value where the higher the weight, the higher the priority.

```

sysname# config
sysname(config)# classifier match-order manual
sysname(config)# classifier 1 weight 12345 source-port 1/1

```


Cluster Commands

Use these commands to configure cluster management.

14.1 Command Summary

The following section lists the commands for this feature.

Table 36 cluster Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show cluster</code> | Displays cluster management status. | E | 3 |
| <code>cluster <vlan-id></code> | Enables clustering in the specified VLAN group. | C | 13 |
| <code>no cluster</code> | Disables cluster management on the Switch. | C | 13 |
| <code>cluster name <cluster name></code> | Sets a descriptive name for the cluster. <i><cluster name></i> : You may use up to 32 printable characters (spaces are allowed). | C | 13 |
| <code>show cluster candidates</code> | Displays the switches that are potential cluster members. The switches must be directly connected. | E | 3 |
| <code>cluster member <mac> password <password></code> | Adds the specified device to the cluster. You have to specify the password of the device too. | C | 13 |
| <code>show cluster member</code> | Displays the cluster member(s) and their running status. | E | 3 |
| <code>show cluster member config</code> | Displays the current cluster member(s). | E | 3 |
| <code>show cluster member mac <mac></code> | Displays the running status of the cluster member(s). | E | 3 |
| <code>cluster rcommand <mac></code> | Logs into the CLI of the specified cluster member. | C | 13 |
| <code>no cluster member <mac></code> | Removes the cluster member. | C | 13 |

14.2 Command Examples

This example creates the cluster CManage in VLAN 1. Then, it looks at the current list of candidates for membership in this cluster and adds two switches to cluster.

```

sysname# configure
sysname(config)# cluster 1
sysname(config)# cluster name CManage
sysname(config)# exit
sysname# show cluster candidates
  Clustering Candidates:
  Index Candidates(MAC/HostName/Model)
    0 00:13:49:00:00:01/ES-2108PWR/ES-2108PWR
    1 00:13:49:00:00:02/GS-3012/GS-3012
    2 00:19:cb:00:00:02/ES-3124/ES-3124
sysname# configure
sysname(config)# cluster member 00:13:49:00:00:01 password 1234
sysname(config)# cluster member 00:13:49:00:00:02 password 1234
sysname(config)# exit
sysname# show cluster member
  Clustering member status:
  Index MACAddr           Name                      Status
    1 00:13:49:00:00:01 ES-2108PWR                Online
    2 00:13:49:00:00:02 GS-3012                    Online

```

The following table describes the labels in this screen.

Table 37 show cluster member

| LABEL | DESCRIPTION |
|---------|---|
| Index | This field displays an entry number for each member. |
| MACAddr | This field displays the member's MAC address. |
| Name | This field displays the member's system name. |
| Status | <p>This field displays the current status of the member in the cluster.</p> <p>Online: The member is accessible.</p> <p>Error: The member is connected but not accessible. For example, the member's password has changed, or the member was set as the manager and so left the member list. This status also appears while the Switch finishes adding a new member to the cluster.</p> <p>Offline: The member is disconnected. It takes approximately 1.5 minutes after the link goes down for this status to appear.</p> |

This example logs in to the CLI of member 00:13:49:00:00:01, looks at the current firmware version on the member Switch, logs out of the member's CLI, and returns to the CLI of the manager.

```

sysname# configure
sysname(config)# cluster rcommand 00:13:49:00:00:01
Connected to 127.0.0.2
Escape character is '^]'.

User name: admin

Password: ****
Copyright (c) 1994 - 2007 ZyXEL Communications Corp.

ES-2108PWR# show version
  Current ZyNOS version: V3.80(ABS.0)b2 | 05/28/2007
ES-2108PWR# exit
Telnet session with remote host terminated.

Closed
sysname(config)#

```

This example looks at the current status of the Switch's cluster.

```

sysname# show cluster
  Cluster Status: Manager
  VID: 1
  Manager: 00:13:49:ae:fb:7a

```

The following table describes the labels in this screen.

Table 38 show cluster

| LABEL | DESCRIPTION |
|----------------|--|
| Cluster Status | This field displays the role of this Switch within the cluster. Manager: This Switch is the device through which you manage the cluster member switches. Member: This Switch is managed by the specified manager. None: This Switch is not in a cluster. |
| VID | This field displays the VLAN ID used by the cluster. |
| Manager | This field displays the cluster manager's MAC address. |

Date and Time Commands

Use these commands to configure the date and time on the Switch.

15.1 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 39 time User-input Values

| COMMAND | DESCRIPTION |
|----------------|---|
| <i>week</i> | Possible values (daylight-saving-time commands only): first, second, third, fourth, last. |
| <i>day</i> | Possible values (daylight-saving-time commands only): Sunday, Monday, Tuesday, ... |
| <i>month</i> | Possible values (daylight-saving-time commands only): January, February, March, ... |
| <i>o'clock</i> | Possible values (daylight-saving-time commands only): 0-23 |

The following section lists the commands for this feature.

Table 40 time Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show time</code> | Displays current system time and date. | E | 3 |
| <code>time <hour:min:sec></code> | Sets the current time on the Switch. <i>hour</i> : 0-23 <i>min</i> : 0-59 <i>sec</i> : 0-59 Note: If you configure Daylight Saving Time after you configure the time, the Switch will apply Daylight Saving Time. | C | 13 |
| <code>time date <month/day/year></code> | Sets the current date on the Switch. <i>month</i> : 1-12 <i>day</i> : 1-31 <i>year</i> : 1970-2037 | C | 13 |
| <code>time timezone <-1200 ... 1200></code> | Selects the time difference between UTC (formerly known as GMT) and your time zone. | C | 13 |
| <code>time daylight-saving-time</code> | Enables daylight saving time. The current time is updated if daylight saving time has started. | C | 13 |

Table 40 time Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| time daylight-saving-time start-date <week> <day> <month> <o'clock> | Sets the day and time when Daylight Saving Time starts. In most parts of the United States, Daylight Saving Time starts on the second Sunday of March at 2 A.M. local time. In the European Union, Daylight Saving Time starts on the last Sunday of March at 1 A.M. GMT or UTC, so the <i>o'clock</i> field depends on your time zone. | C | 13 |
| time daylight-saving-time end-date <week> <day> <month> <o'clock> | Sets the day and time when Daylight Saving Time ends. In most parts of the United States, Daylight Saving Time ends on the first Sunday of November at 2 A.M. local time. In the European Union, Daylight Saving Time ends on the last Sunday of October at 1 A.M. GMT or UTC, so the <i>o'clock</i> field depends on your time zone. | C | 13 |
| no time daylight-saving-time | Disables daylight saving on the Switch. | C | 13 |
| time daylight-saving-time help | Provides more information about the specified command. | C | 13 |

Table 41 timesync Command Summary

| COMMAND | DESCRIPTION | M | P |
|-----------------------------|---|---|----|
| show timesync | Displays time server information. | E | 3 |
| timesync server <address> | Sets the IP address or domain name of up to three timeservers. The Switch tries to synchronize with the first server. If the synchronization fails, then the Switch goes through the rest of the list in order. The Switch attempts to connect to the timeserver for up to 60 seconds. The Switch synchronizes with the time server in the following situations: <ul style="list-style-type: none"> • When the Switch starts up. • Every 24 hours after the Switch starts up. • When the time server IP address or protocol is updated. | C | 13 |
| timesync <daytime time ntp> | Sets the time server protocol. You have to configure a time server before you can specify the protocol. | C | 13 |
| no timesync | Disables timeserver settings. | C | 13 |

15.2 Command Examples

This example sets the current date, current time, time zone, and daylight savings time.

```

sysname# configure
sysname(config)# time date 06/04/2007
sysname(config)# time timezone -600
sysname(config)# time daylight-saving-time
sysname(config)# time daylight-saving-time start-date second Sunday
--> March 2
sysname(config)# time daylight-saving-time end-date first Sunday
--> November 2
sysname(config)# time 13:24:00
sysname(config)# exit
sysname# show time
Current Time 13:24:03 (UTC-05:00 DST)
Current Date 2007-06-04

```

This example looks at the current time server settings.

```

sysname# show timesync

Time Configuration
-----
Time Zone           :UTC -600
Time Sync Mode      :USE_DAYTIME
Time Server IP Address :172.16.37.10

Time Server Sync Status:CONNECTING

```

The following table describes the labels in this screen.

Table 42 show timesync

| LABEL | DESCRIPTION |
|-------------------------|---|
| Time Zone | This field displays the time zone. |
| Time Sync Mode | This field displays the time server protocol the Switch uses. It displays NO_TIMESERVICE if the time server is disabled. |
| Time Server IP Address | This field displays the IP address of the time server. |
| Time Server Sync Status | This field displays the status of the connection with the time server. NONE: The time server is disabled. CONNECTING: The Switch is trying to connect with the specified time server. OK: Synchronize with time server done. FAIL: Synchronize with time server fail. |

Data Center Bridging Commands

At the time of writing, data center bridging can only be configured using commands on the Switch.

16.1 Overview

A traditional Ethernet network is best-effort, that is, frames may be dropped due to network congestion. FCoE (Fiber Channel over Ethernet) transparently encapsulates fiber channel traffic into Ethernet, so that you don't need separate fiber channel and Ethernet switches.

Data Center Bridging (DCB) enhances Ethernet technology to adapt to the FCoE. It supports lossless Ethernet traffic (no frames discarded when there is network congestion) and can allocate bandwidth for different traffic classes, based on IEEE802.1p priority with a guaranteed minimum bandwidth. LAN traffic (large number of flows and not latency-sensitive), SAN traffic (Storage Area Network, large packet sizes and requires lossless performance), and IPC traffic (Inter-Process Communication, latency-sensitive messages) can share the same physical connection while still having their own priority and guaranteed minimum bandwidth.

You should configure DCB on any port that has both Ethernet and fiber channel traffic.

16.1.1 PFC, ETS, and DCBX Standards

DCB may use PFC, ETS, application priority and DCBX to adapt to the FCoE.

- PFC (Priority-based Flow Control, IEEE 802.1Qbb -2011) is a flow control mechanism that uses a PAUSE frame to suspend traffic of a certain priority rather than drop it when there is network congestion (lossless). If an outgoing (egress) port buffer is almost full, the Switch transmits a PAUSE frame to the sender who just transmitted traffic requesting it to stop sending traffic of a certain priority to that port. For example, say outgoing port 8 is receiving too much traffic of priorities 3-6 from port 1. Then if port 1 is configured with PFC priorities 3-6, port 1 can request the sender to suspend traffic with priorities 3-6. Similarly, if the outgoing (egress) port 8 receives a PAUSE frame with PFC priorities 0-1, then if port 8 is configured with PFC, it can suspend sending traffic with PFC priorities 0-1.
- ETS (Enhanced Transmission Selection, IEEE 802.1Qaz -2011) is used to allocate bandwidth for different traffic classes, based on IEEE802.1p priority (0 to 7, allowing for eight types of traffic) with a guaranteed minimum bandwidth.

- Application priority is used to globally assign a priority to all FCoE traffic on the Switch.
- DCBX (Data Center Bridging capability eXchange, IEEE 802.1Qaz -2011) uses LLDP (Link Layer Discovery Protocol) to advertize PFC, ETS and application priority information between switches. PFC information should be consistent between connected switches, so PFC can be configured automatically using DCBX.

The following table describes user-input values available in multiple commands for this feature.

Table 43 dcb User-input Values

| COMMAND | DESCRIPTION |
|------------------------------------|--|
| <code><priority-list></code> | Possible values range from 0 to 7. |
| <code><port-list></code> | Possible values range from 1 to the number of ports on your Switch. |
| <code><id></code> | Possible values for traffic class ID range from 1 to 100. 0 is a default traffic class and cannot be modified or deleted. |
| <code><tc-idN></code> | The traffic class ID for priority N (0 to 7). The traffic class ID range is from 1 to 100. |
| <code><name></code> | Up to 32 printable ASCII characters. Names with spaces must be enclosed in quotes. For example, "My Class". |
| <code><weight></code> | Possible values range from 1 to 127 for unicast or multicast weights. Possible values range from 1 to 100 for WFQ traffic class weight. |

16.2 Command Summary

This section shows the commands and examples for PFC, ETS, Application Priority and DCBX.

16.2.1 PFC

PFC should be configured the same on connected switch ports. If DCBX is used, then one switch port must be configured to accept network configuration from the peer switch port (auto). If both switch ports are configured to accept configuration (auto on both switch ports), then the configuration of the switch port with the lowest MAC address hex value sum is used.

The following table lists the commands for this feature.

Table 44 priority-flow-control Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>priority-flow-control</code> | Enables PFC on the specified port(s). | C | 13 |
| <code>no priority-flow-control</code> | Disables PFC on the specified port(s). | C | 13 |
| <code>priority-flow-control auto</code> | Sets the port to accept PFC configuration from the connected Switch port. | C | 13 |
| <code>priority-flow-control priority <priority-list></code> | Sets the priority value(s) on the specified port(s). | C | 13 |
| <code>no priority-flow-control priority</code> | Clears the priority value(s) on the specified port(s). | C | 13 |

Table 44 priority-flow-control Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| show priority-flow-control | Displays PFC settings. | E | 3 |
| show priority-flow-control statistics interface port-channel <port-list> | Displays PFC statistics on the specified port(s). | E | 3 |
| clear priority-flow-control statistics interface port-channel <port-list> | Clears PFC statistics on the specified port(s). | E | 13 |

16.2.2 PFC Command Examples

In the following example, PFC on switch A, port 1, is set to auto, so that it can accept the priority configuration from the peer switch B. If switch A did not receive PFC PDU from switch B, then priority 2, will be used by switch A.

```
switchA# configure
switchA(config)# interface port-channel 1
switchA(config-interface)# priority-flow-control auto
switchA(config-interface)# priority-flow-control priority 2

switchB# configure
switchB(config)# interface port-channel 1
switchB(config-interface)# priority-flow-control
switchB(config-interface)# priority-flow-control priority 3-5
```

Use the show command to see the PFC configuration. Operation-Priority shows whether switch A is using switch B's configured priorities or not.

In the following example, Switch A is using Switch B's configured priorities.

```
switchA# show priority-flow-control
  Port      Admin      Operation      Admin-Priority      Operation-Priority
  -----
  1         Auto         On              2                    3-5
```

In the following example, Switch A is NOT using Switch B's configured priorities.

```
switchA# show priority-flow-control
  Port      Admin      Operation      Admin-Priority      Operation-Priority
  -----
  1         Auto         On              2                    2
```

This is an example showing how many pause frames of certain priorities were temporarily stopped (transmitted or received) on port 1.

```

sysname# show priority-flow-control statistics interface port-channel 1
Port Number: 1
PFC Tx
          Priority 0: 0
          Priority 1: 0
          Priority 2: 0
          Priority 3: 0
          Priority 4: 0
          Priority 5: 0
          Priority 6: 0
          Priority 7: 0

PFC Rx
          Priority 0: 0
          Priority 1: 0
          Priority 2: 0
          Priority 3: 0
          Priority 4: 0
          Priority 5: 0
          Priority 6: 0
          Priority 7: 0

sysname#

```

16.2.3 ETS

An IEEE 802.1p priority is assigned to a traffic class with guaranteed minimum bandwidth. A traffic class can use SP (Strict Priority) or WFQ (Weighted Fair Queue) queuing method. Available link bandwidth is reserved first for SP traffic. The guaranteed minimum bandwidth for non-SP traffic (WFQ) is its weight value by remaining available bandwidth. If a non-strict-priority-traffic-class does not consume its allocated bandwidth, other non-strict-priority-traffic-classes can share the unused bandwidth according to the weight ratio.

16.2.3.1 Notes on ETS

- Priority 0 does not mean the highest or lowest priority. Priority level of importance is mapped to a queue level (with queue level 0, the lowest importance).
- You don't automatically configure ETS using DCBX negotiation. ETS is configured manually on each Switch.
- All priorities are mapped to traffic class ID 0 by default.
- The default traffic class (named `Default`) has ID 0, and is an SP traffic-class. It cannot be modified or deleted.
- You can create up to 100 traffic class profiles, with ID from 1 to 100.
- The weight range of WFQ traffic-class can be from 1 to 100.
- Bandwidth can also be prioritized depending on whether traffic is unicast traffic or non-unicast (broadcast, multicast, DLF) traffic. For example, 100:50 means twice as much unicast traffic to non-unicast traffic is allowed when there is network congestion. The weight ranges of unicast and non-unicast traffic can be from 1 to 127.

The following table lists the commands for this feature.

Table 45 ets Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>traffic-class <id> scheduler <sp ets <weight>> [name <name>]</code> | Creates a WFQ or SP traffic class with ID, weight and (optional) name. | C | 13 |
| <code>no traffic-class <id></code> | Deletes the SP/WFQ traffic class with specified ID. | C | 13 |
| <code>show traffic-class</code> | Shows a summary of traffic class(es) created on the Switch. | E | 3 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>ets</code> | Enable Enhanced Transmission Selection (ETS) queuing method. See Chapter 65 on page 245 for other queuing methods. | C | 13 |
| <code>ets traffic-class binding <tc-id0> <tc-id1> <tc-id2> <tc-id3> <tc-id4> <tc-id5> <tc-id6> <tc-id7></code> | Binds priorities to a traffic class(es) on the specified port(s). | C | 13 |
| <code>no ets traffic-class binding</code> | Resets traffic class binding priorities to default settings on the specified port(s). | C | 13 |
| <code>unicast-nonunicast-weight <weight> <weight></code> | Sets the unicast to non-unicast traffic weight ratio on the specified port(s). | C | 13 |

16.2.4 ETS Command Example 1

This is an example where the non-editable default traffic class, ID 0, uses SP queuing. LAN and SAN traffic uses WFQ queuing with equal weighting of 50 each.

Table 46 ETS Example Traffic Classes

| TRAFFIC CLASS ID | GUARANTEED BANDWIDTH | NAME |
|------------------|----------------------|---------|
| 0 | SP | Default |
| 1 | 50 | SAN |
| 2 | 50 | LAN |

The guaranteed minimum bandwidth for both SAN and LAN traffic is 2.5Gbps with a link bandwidth of 10Gbps.

Table 47 ETS Example Traffic Bandwidths

| NAME | INCOMING TRAFFIC BANDWIDTH (GBPS) | GUARANTEED MINIMUM BANDWIDTH | OUTGOING TRAFFIC BANDWIDTH (GBPS) |
|---------|-----------------------------------|-------------------------------|-----------------------------------|
| Default | 5 | 5 (SP) | 5 |
| SAN | 3 | $(10-5) * (50/(50+50)) = 2.5$ | 2.5 |
| LAN | 4 | $(10-5) * (50/(50+50)) = 2.5$ | 2.5 |

Create and name traffic class IDs, with weights for the non-SP traffic type.

```

sysname# configure
sysname(config)# traffic-class 1 scheduler ets 50 name LAN
sysname(config)# traffic-class 2 scheduler ets 50 name SAN

```

This command shows traffic class.

```
switch# show traffic-class
Traffic Class Profile Configuration:

Traffic Class ID  Scheduler  Weight  Name
-----
0                 sp        -       Default
1                 ets       50      LAN
2                 ets       50      SAN
```

Next, configure a port for traffic class(es) and bind priorities to traffic classes on a port. In the next example, we configure port 1 and bind priorities 0, 1 and 2 to traffic class 2 (LAN), 3, 4, 5 and 6 to class 1 (SAN) and 7 to class 0, the default traffic class.

Table 48 ETS Example Priority Traffic Class ID Mapping

| PRIORITY | TRAFFIC CLASS ID | NAME |
|----------|------------------|---------|
| 0 | 2 | LAN |
| 1 | 2 | LAN |
| 2 | 2 | LAN |
| 3 | 1 | SAN |
| 4 | 1 | SAN |
| 5 | 1 | SAN |
| 6 | 1 | SAN |
| 7 | 0 | Default |

```
sysname(config)# interface port-channel 1
sysname(config-interface)# ets
sysname(config-interface)# ets traffic-class binding 2 2 2 1 1 1 1 0
sysname(config-interface)# unicast-nonunicast-weight 100 100
sysname(config-interface)# exit
```

16.2.5 Application Priority

Use the application priority command to assign a priority to all FCoE traffic on a switch.

The following table lists the commands for this feature.

Table 49 application priority Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| lldp dcbx application <ether-type><fcoe> priority <0-7> | Assigns the specified priority value to all FCoE traffic on the Switch. | C | 13 |
| no lldp dcbx application <ether-type > <fcoe> | Clears priority value for all FCoE traffic on the Switch. | C | 13 |

16.2.6 Application Priority Command Examples

In the following example, all FCoE traffic on the switch is assigned with priority 3.

```
switchA# configure
switchA(config)# lldp dcbx application ether-type fcoe priority 3
```

Application priority can then be used in conjunction with ETS and PFC as shown in the following examples.

This is an application priority command example with PFC.

```
switchA(config)# interface port-channel 5
switchA(config-interface)# priority-flow-control
switchA(config-interface)# priority-flow-control priority 3

switchB(config)# interface port-channel 6
switchB(config-interface)# priority-flow-control
switchB(config-interface)# priority-flow-control priority 3
```

This is an application priority command example with ETS.

- Default traffic class 0 with strict priority for priorities 0, 1, 2, 6, 7
- Traffic class 3 (for legacy Ethernet traffic): Guarantee bandwidth 40% for priority 4, 5
- Traffic class 4 (for FCoE traffic): Guarantee bandwidth 60% for priority 3
- Unicast to Non-Unicast weight ratio is 100:100

Table 50 ETS Example 2 Traffic Classes

| PRIORITY | TRAFFIC CLASS ID | NAME |
|----------|------------------|----------|
| 0 | 0 | Default |
| 1 | 0 | Default |
| 2 | 0 | Default |
| 3 | 4 | FCoE |
| 4 | 3 | Ethernet |
| 5 | 3 | Ethernet |
| 6 | 0 | Default |
| 7 | 0 | Default |

```
sysname# configure
sysname(config)# traffic-class 3 scheduler ets 40 name ethernet
sysname (config)# traffic-class 4 scheduler ets 60 name fcoe
sysname (config)# interface port-channel 6
sysname (config-interface)# ets
sysname (config-interface)# ets traffic-class binding 0 0 0 4 3 3 0 0
sysname (config-interface)# unicast-nonunicast-weight 100 100
```

16.2.7 DCBX

DCBX uses LLDP (Link Layer Discovery Protocol) to exchange PFC, ETS and application priority information between switches. PFC information should be consistent between switches, so this can be configured automatically using DCBX.

See [Chapter 39 on page 165](#) for more information on LLDP.

In order for switches to exchange information, they must send their type-length values (TLVs) in order to be able to read each other's information.

The following table lists the commands for this feature.

Table 51 dcbx Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>lldp org-specific-tlv dot1 dcbx-ets-configuration</code> | Enables the sending of ETS TLVs on the specified port(s). | C | 13 |
| <code>lldp org-specific-tlv dot1 dcbx-pfc-configuration</code> | Enables the sending of PFC TLVs on the specified port(s). | C | 13 |
| <code>lldp org-specific-tlv dot1 dcbx-application-priority</code> | Enables the sending of application priority TLVs on the specified port(s). | C | 13 |

This is a DCBX command example.

```

sysname# configure
sysname(config)# lldp
interface port-channel 2
sysname(config-interface)# lldp admin-status tx-rx
sysname(config-interface)# lldp org-specific-tlv dot1 dcbx-ets-
configuration
sysname(config-interface)# lldp org-specific-tlv dot1 dcbx-pfc-
configuration
sysname(config-interface)# lldp org-specific-tlv dot1 dcbx-application-
priority
sysname(config-interface)#exit
sysname(config)# exit
sysname#

```

See [Chapter 39 on page 165](#) for LLDP command examples.

DHCP Commands

Use these commands to configure DHCP features on the Switch.

- Use the `dhcp option` commands to configure DHCP Option 82 profiles.
- Use the `dhcp relay` commands to configure DHCP relay for specific VLAN.
- Use the `dhcp smart-relay` commands to configure DHCP relay for all broadcast domains.
- Use the `dhcp server` commands to configure the Switch as a DHCP server. (This command is available on a layer 3 Switch only.)

17.1 Command Summary

The following section lists the commands for this feature.

Table 52 dhcp option Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>dhcp option profile <name></code> [<code>circuit-id</code> [slot-port] [vlan] [hostname] [string <string>]] [<code>remote-id</code> [mac] [string <string>]] | Creates a DHCPv4 option 82 profile. | C | 13 |
| <code>no dhcp option profile <name></code> | Deletes the specified DHCPv4 option 82 profile. | C | 13 |
| <code>show dhcp option profile</code> | Displays DHCP option 82 profile settings. | E | 3 |

Table 53 dhcp relay Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show dhcp relay <vlan-id></code> | Displays DHCP relay settings for the specified VLAN. | E | 3 |
| <code>dhcp relay <vlan-id> helper-address <remote-dhcp-server1></code> [<remote-dhcp-server2>] [<remote-dhcp-server3>] [option] [information] | Enables DHCP relay on the specified VLAN and sets the IP address of up to 3 DHCP servers. Optionally, sets the Switch to add relay agent information and system name. Note: You have to configure the VLAN before you configure a DHCP relay for the VLAN. You have to disable <code>dhcp smart-relay</code> before you can enable <code>dhcp relay</code> . | C | 13 |

Table 53 dhcp relay Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| dhcp relay <vlan-id> helper-address <remote-dhcp-server1> [<i><remote-dhcp-server2></i>] [<i><remote-dhcp-server3></i>] [option profile <name>] | Enables DHCP relay on the specified VLAN and sets the IP address of up to 3 DHCP servers. Optionally, specify a pre-defined DHCP option 82 profile that the Switch applies to all ports in this VLAN. Note: You have to configure the VLAN before you configure a DHCP relay for the VLAN. You have to disable <code>dhcp smart-relay</code> before you can enable <code>dhcp relay</code> . | C | 13 |
| dhcp relay <vlan-id> interface port-channel <port-list> option profile <name> | Specifies a pre-defined DHCP option 82 profile that the Switch applies to the specified port(s) in this VLAN. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server. | C | 13 |
| no dhcp relay <vlan-id> | Disables DHCP relay. | C | 13 |
| no dhcp relay <vlan-id> information | System name is not appended to option 82 information field. | C | 13 |
| no dhcp relay <vlan-id> interface port-channel <port-list> option | Sets the Switch to not apply a DHCP option 82 profile to the specified port(s) in this VLAN. | C | 13 |
| no dhcp relay <vlan-id> option | Disables the relay agent information option 82. | C | 13 |

Table 54 dhcp relay-broadcast Command Summary

| COMMAND | DESCRIPTION | M | P |
|-------------------------|--|---|----|
| dhcp relay-broadcast | The broadcast behavior of DHCP packets (within the VLAN(s) on which DHCP relay is enabled) will not be terminated by the Switch. | C | 13 |
| no dhcp relay-broadcast | The Switch terminates the broadcast behavior of DHCP packets within the VLAN(s) on which DHCP relay is enabled. | C | 13 |

Table 55 dhcp smart-relay Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| show dhcp smart-relay | Displays global DHCP relay settings. | E | 3 |
| dhcp smart-relay | Enables DHCP relay for all broadcast domains on the Switch. Note: You have to disable <code>dhcp relay</code> before you can enable <code>dhcp smart-relay</code> . | C | 13 |
| no dhcp smart-relay | Disables global DHCP relay settings. | C | 13 |
| dhcp smart-relay helper-address <remote-dhcp-server1> [<i><remote-dhcp-server2></i>] [<i><remote-dhcp-server3></i>] | Sets the IP addresses of up to 3 DHCP servers. | C | 13 |
| dhcp smart-relay information | Allows the Switch to add system name to agent information. | C | 13 |
| no dhcp smart-relay information | System name is not appended to option 82 information field for global dhcp settings. | C | 13 |

Table 55 dhcp smart-relay Command Summary (continued)

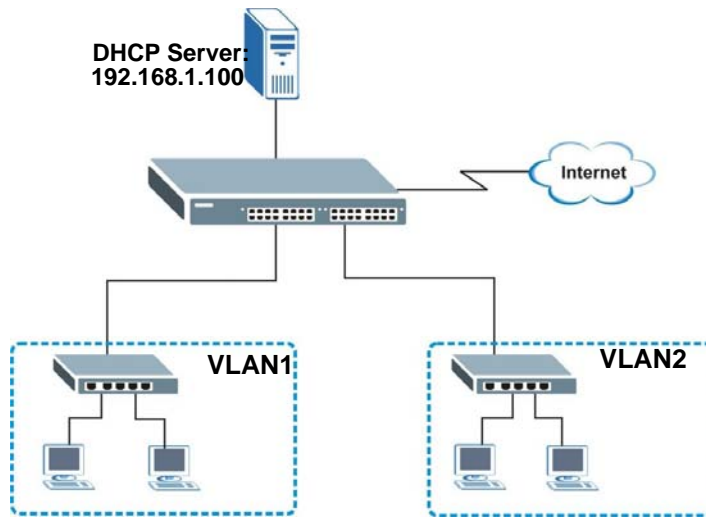
| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| dhcp smart-relay interface port-channel <port-list> option profile <name> | Specifies a pre-defined DHCP option 82 profile that the Switch applies to the specified port(s). Note: The profile you specify here has priority over the one you set using the dhcp smart-relay option profile <name> command. | C | 13 |
| dhcp smart-relay option | Allows the Switch to add DHCP relay agent information. | C | 13 |
| dhcp smart-relay option profile <name> | Specifies a pre-defined DHCPv4 option 82 profile that the Switch applies to all ports. The Switch adds the Circuit ID sub-option and/or Remote ID sub-option specified in the profile to DHCP requests that it relays to a DHCP server. | C | 13 |
| no dhcp smart-relay interface port-channel <port-list> | Sets the Switch to not apply a DHCP option 82 profile to the specified port(s). | C | 13 |
| no dhcp smart-relay option | Disables the relay agent information option 82 for global dhcp settings. | C | 13 |

Table 56 dhcp server Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| dhcp server <vlan-id> starting-address <ip-addr> <subnet-mask> size-of-client-ip-pool <1-253> | Enables DHCP server for the specified VLAN and specifies the TCP/IP configuration details to send to DHCP clients. | C | 13 |
| dhcp server <vlan-id> starting-address <ip-addr> <subnet-mask> size-of-client-ip-pool <1-253> [default-gateway <ip-addr>] [primary-dns <ip-addr>] [secondary-dns <ip-addr>] | Enables DHCP server for the specified VLAN and specifies the TCP/IP configuration details to send to DHCP clients. Including default gateway IP address and DNS server information. | C | 13 |
| no dhcp server <vlan-id> | Disables DHCP server for the specified VLAN. | C | 13 |
| no dhcp server <vlan-id> default-gateway | Disables DHCP server default gateway settings. | C | 13 |
| no dhcp server <vlan-id> primary-dns | Disables DHCP primary DNS server settings. | C | 13 |
| no dhcp server <vlan-id> secondary-dns | Disables DHCP server secondary DNS settings. | C | 13 |
| show dhcp server | Displays DHCP server settings. | E | 13 |
| show dhcp server <vlan-id> | Displays DHCP server settings in a specified VLAN. | E | 13 |

17.2 Command Examples

In this example, the Switch relays DHCP requests for the **VLAN1** and **VLAN2** domains. There is only one DHCP server for DHCP clients in both domains.

Figure 3 Example: Global DHCP Relay

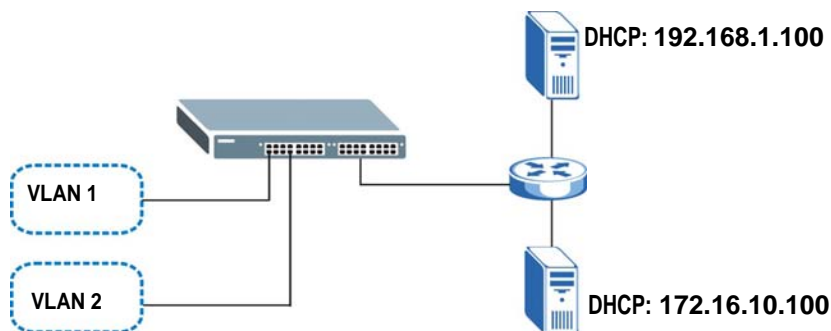
This example shows how to configure the Switch for this configuration. DHCP relay agent information option 82 is also enabled.

```

sysname# configure
sysname(config)# dhcp smart-relay
sysname(config)# dhcp smart-relay helper-address 192.168.1.100
sysname(config)# dhcp smart-relay option
sysname(config)# exit
sysname# show dhcp smart-relay
DHCP Relay Agent Configuration
Active:          Yes
Remote DHCP Server 1:192.168.1.100
Remote DHCP Server 2:  0.0.0.0
Remote DHCP Server 3:  0.0.0.0
Option82:  Enable      Option82Inf: Disable

```

In this example, there are two VLANs (VIDs 1 and 2) in a campus network. Two DHCP servers are installed to serve each VLAN. The Switch forwards DHCP requests from the dormitory rooms (VLAN 1) to the DHCP server with IP address 192.168.1.100. DHCP requests from the academic buildings (VLAN 2) are sent to the other DHCP server with IP address 172.16.10.100.

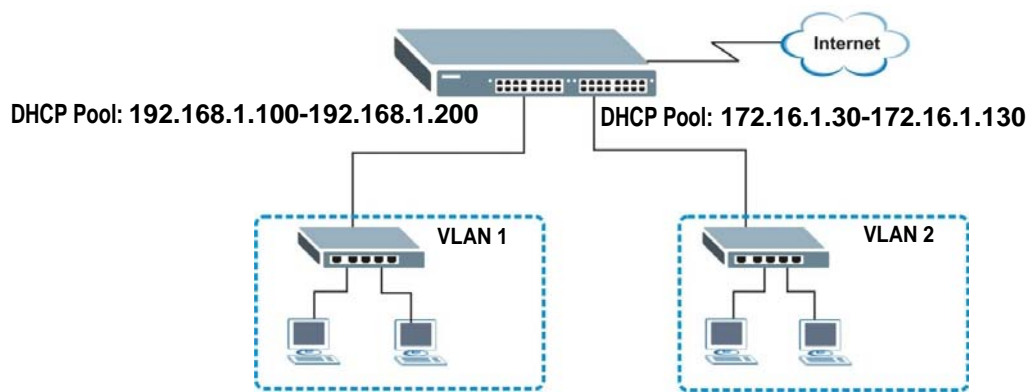
Figure 4 Example: DHCP Relay for Two VLANs

This example shows how to configure these DHCP servers. The VLANs are already configured.

```
sysname# configure
sysname(config)# dhcp relay 1 helper-address 192.168.1.100
sysname(config)# dhcp relay 2 helper-address 172.16.10.100
sysname(config)# exit
```

In this example, the Switch is a DHCP server for clients on VLAN 1 and VLAN 2. The DHCP clients in VLAN 1 are assigned IP addresses in the range 192.168.1.100 to 192.168.1.200 and clients on VLAN 2 are assigned IP addresses in the range 172.16.1.30 to 172.16.1.130.

Figure 5 Example: DHCP Relay for Two VLANs



This example shows how to configure the DHCP server for VLAN 1 with the configuration shown in [Figure 5 on page 75](#). It also provides the DHCP clients with the IP address of the default gateway and the DNS server.

```
sysname# configure
sysname(config)# dhcp server 1 starting-address 192.168.1.100
255.255.255.0 size-of-client-ip-pool 100 default-gateway 192.168.1.1
primary-dns 192.168.5.1
```

DHCP Snooping & DHCP VLAN Commands

Use the `dhcp snooping` commands to configure the DHCP snooping on the Switch and the `dhcp vlan` commands to specify a DHCP VLAN on your network. DHCP snooping filters unauthorized DHCP packets on the network and builds the binding table dynamically.

18.1 Command Summary

The following section lists the commands for this feature.

Table 57 dhcp snooping Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show dhcp snooping</code> | Displays DHCP snooping configuration on the Switch. | E | 3 |
| <code>show dhcp snooping binding</code> | Displays the DHCP binding table. | E | 3 |
| <code>show dhcp snooping database</code> | Displays DHCP snooping database update statistics and settings. | E | 3 |
| <code>show dhcp snooping database detail</code> | Displays DHCP snooping database update statistics in full detail form. | E | 3 |
| <code>show dhcp snooping option [vlan <vlan-list>][interface <port-list>]</code> | Displays the DHCP option 82 profile that the Switch applies to ports in the specified VLAN or to the specified port(s). | E | 3 |
| <code>dhcp snooping</code> | Enables DHCP Snooping on the Switch. | C | 13 |
| <code>no dhcp snooping</code> | Disables DHCP Snooping on the Switch. | C | 13 |
| <code>dhcp snooping database <tftp://host/filename></code> | Specifies the location of the DHCP snooping database. The location should be expressed like this: tftp://{domain name or IP address}/directory, if applicable/file name ; for example, tftp://192.168.10.1/database.txt . | C | 13 |
| <code>no dhcp snooping database</code> | Removes the location of the DHCP snooping database. | C | 13 |
| <code>dhcp snooping database timeout <seconds></code> | Specifies how long (10-65535 seconds) the Switch tries to complete a specific update in the DHCP snooping database before it gives up. | C | 13 |
| <code>no dhcp snooping database timeout</code> | Resets how long (10-65535 seconds) the Switch tries to complete a specific update in the DHCP snooping database before it gives up to the default value (300). | C | 13 |
| <code>dhcp snooping database write-delay <seconds></code> | Specifies how long (10-65535 seconds) the Switch waits to update the DHCP snooping database the first time the current bindings change after an update. | C | 13 |

Table 57 dhcp snooping Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| no dhcp snooping database write-delay | Resets how long (10-65535 seconds) the Switch waits to update the DHCP snooping database the first time the current bindings change after an update to the default value (300). | C | 13 |
| dhcp snooping vlan <vlan-list> | Specifies the VLAN IDs for VLANs you want to enable DHCP snooping on. | C | 13 |
| no dhcp snooping vlan <vlan-list> | Specifies the VLAN IDs for VLANs you want to disable DHCP snooping on. | C | 13 |
| dhcp snooping vlan <vlan-list> information | Sets the Switch to add the system name to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. | C | 13 |
| no dhcp snooping vlan <vlan-list> information | Sets the Switch to not add the system name to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. | C | 13 |
| dhcp snooping vlan <vlan-list> interface port-channel <port-list> option profile <name> | Specifies a pre-defined DHCP option 82 profile that the Switch applies to the specified port(s) in the specified VLAN. | C | 13 |
| no dhcp snooping vlan <vlan-list> interface port-channel <port-list> option | Sets the Switch to not apply a DHCP option 82 profile to the specified port(s). | C | 13 |
| dhcp snooping vlan <vlan-list> option | Sets the Switch to add the slot number, port number and VLAN ID to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. | C | 13 |
| no dhcp snooping vlan <vlan-list> option | Sets the Switch to not add the slot number, port number and VLAN ID to DHCP requests that it broadcasts to the DHCP VLAN, if specified, or VLAN. | C | 13 |
| dhcp snooping vlan <vlan-list> option profile <name> | Specifies a pre-defined DHCP option 82 profile that the Switch applies to all ports in the specified VLAN. | C | 13 |
| no dhcp snooping vlan <vlan-list> option | Sets the Switch to not apply a DHCP option 82 profile to all ports in the specified VLAN. | C | 13 |
| clear dhcp snooping database statistics | Delete all statistics records of DHCP requests going through the Switch. | E | 13 |
| renew dhcp snooping database | Loads dynamic bindings from the default DHCP snooping database. | E | 13 |
| renew dhcp snooping database <tftp://host/filename> | Loads dynamic bindings from the specified DHCP snooping database. | E | 13 |
| interface port-channel <port-list> | Enables a port or a list of ports for configuration. | C | 13 |
| dhcp snooping trust | Sets this port as a trusted DHCP snooping port. Trusted ports are connected to DHCP servers or other switches, and the Switch discards DHCP packets from trusted ports only if the rate at which DHCP packets arrive is too high. | C | 13 |
| dhcp snooping limit rate <pps> | Sets the maximum rate in packets per second (pps) that DHCP packets are allowed to arrive at a trusted DHCP snooping port. | C | 13 |
| no dhcp snooping trust | Disables this port from being a trusted port for DHCP snooping. | C | 13 |
| no dhcp snooping limit rate | Resets the DHCP snooping rate to the default (0). | C | 13 |

The following table describes the `dhcp-vlan` commands.

Table 58 dhcp-vlan Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>dhcp dhcp-vlan <vlan-id></code> | Specifies the VLAN ID of the DHCP VLAN. | C | 13 |
| <code>no dhcp dhcp-vlan</code> | Disables DHCP VLAN on the Switch. | C | 13 |

18.2 Command Examples

This example:

- Enables DHCP snooping Switch.
- Sets up an external DHCP snooping database on a network server with IP address 172.16.37.17.
- Enables DHCP snooping on VLANs 1,2,3,200 and 300.
- Sets the Switch to add the slot number, port number and VLAN ID to DHCP requests that it broadcasts to the DHCP VLAN.
- Sets ports 1 - 5 as DHCP snooping trusted ports.
- Sets the maximum number of DHCP packets that can be received on ports 1 - 5 to 100 packets per second.
- Configures a DHCP VLAN with a VLAN ID 300.

- Displays DHCP snooping configuration details.

```

sysname(config)# dhcp snooping
sysname(config)# dhcp snooping database tftp://172.16.37.17/
snoopdata.txt
sysname(config)# dhcp snooping vlan 1,2,3,200,300
sysname(config)# dhcp snooping vlan 1,2,3,200,300 option
sysname(config)# interface port-channel 1-5
sysname(config-interface)# dhcp snooping trust
sysname(config-interface)# dhcp snooping limit rate 100
sysname(config-interface)# exit
sysname(config)# dhcp dhcp-vlan 300
sysname(config)# exit
sysname# show dhcp snooping
Switch DHCP snooping is enabled
DHCP Snooping is configured on the following VLANs:
  1-3,200,300
Option 82 is configured on the following VLANs:
  1-3,200,300
Appending system name is configured on the following VLANs:

DHCP VLAN is enabled on VLAN 300
Interface  Trusted  Rate Limit (pps)
-----  -
          1         yes           100
          2         yes           100
          3         yes           100
          4         yes           100
          5         yes           100
          6         no           unlimited
          7         no           unlimited
          8         no           unlimited

```

DiffServ Commands

Use these commands to configure Differentiated Services (DiffServ) on the Switch.

19.1 Command Summary

The following section lists the commands for this feature.

Table 59 diffserv Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show diffserv</code> | Displays general DiffServ settings. | E | 3 |
| <code>diffserv</code> | Enables DiffServ on the Switch. | C | 13 |
| <code>no diffserv</code> | Disables DiffServ on the Switch. | C | 13 |
| <code>diffserv dscp <0-63> priority <0-7></code> | Sets the DSCP-to-IEEE 802.1q mappings. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>diffserv</code> | Enables DiffServ on the port(s). | C | 13 |
| <code>no diffserv</code> | Disables DiffServ on the port(s). | C | 13 |

Display Commands

Use these commands to display configuration information.

20.1 Command Summary

The following section lists the commands for this feature.

Table 60 display Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| display user <[system] [snmp]> | Displays all or specific user account information in the configuration file. system: Displays system account information, such as admin, enable or login username and password. snmp: Displays SNMP user account information. | C | 14 |
| no display user <[system] [snmp]> | Hide all or specific user account information in the configuration file. | C | 14 |
| display aaa <[authentication] [authorization] [server]> | Displays all or specific AAA information in the configuration file. authentication: Displays authentication information in the configuration file. authorization: Displays authorization information in the configuration file. server: Displays authentication server information in the configuration file. | C | 14 |
| no display aaa <[authentication] [authorization] [server]> | Hide all or specific AAA information in the configuration file. | C | 14 |

DVMRP Commands

This chapter explains how to use commands to activate the Distance Vector Multicast Routing Protocol (DVMRP) on the Switch.

21.1 DVMRP Overview

DVMRP (Distance Vector Multicast Routing Protocol) is a protocol used for routing multicast data. DVMRP is used when a router receives multicast traffic and it wants to find out if other multicast routers it is connected to need to receive the data. DVMRP sends the data to all attached routers and waits for a reply. Routers which do not need to receive the data (do not have multicast group member connected) return a “prune” message, which stops further multicast traffic for that group from reaching the router.

21.2 Command Summary

The following section lists the commands for this feature.

Table 61 Command Summary: DVMRP

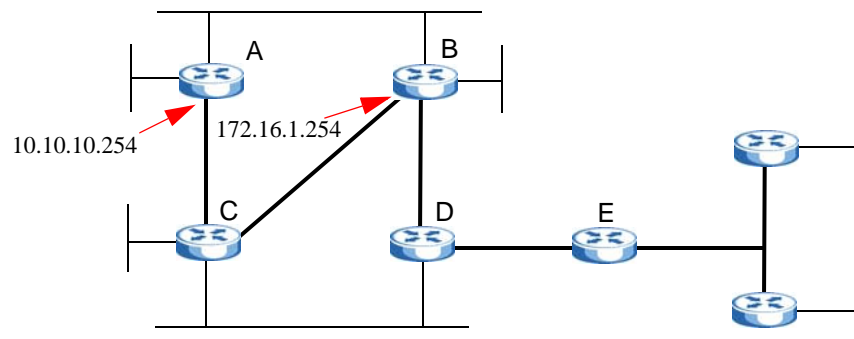
| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| show ip dvmrp group | Displays DVMRP group information. | E | 3 |
| show ip dvmrp interface | Displays DVMRP interface information. | E | 3 |
| show ip dvmrp neighbor | Displays DVMRP neighbor information. | E | 3 |
| show ip dvmrp prune | Displays the DVMRP prune information. | E | 3 |
| show ip dvmrp route | Displays the DVMRP routes. | E | 3 |
| show router dvmrp | Displays DVMRP settings. | E | 3 |
| router dvmrp | Enables and enters the DVMRP configuration mode. | C | 13 |
| exit | Leaves the DVMRP configuration mode. | C | 13 |
| threshold <tvl-value> | Sets the DVMRP threshold value. Multicast packets with TTL (Time-To-Live) value lower than the threshold are not forwarded by the Switch. | C | 13 |
| no router dvmrp | Disables DVMRP on the Switch. | C | 13 |
| interface route-domain <ip-address>/<mask-bits> | Enters the configuration mode for this routing domain. | C | 13 |

Table 61 Command Summary: DVMRP (continued)

| COMMAND | DESCRIPTION | M | P |
|-------------|---|---|----|
| ip dvmrp | Activates this routing domain in participating in DVMRP. | C | 13 |
| no ip dvmrp | Disables this routing domain from participating in DVMRP. | C | 13 |

21.3 Command Examples

In this example, the Switch is configured to exchange DVMRP information with other DVMRP enabled routers as shown next. The Switch is a DVMRP router (C). DVMRP is activated on IP routing domains **10.10.10.1/24** and **172.16.1.1/24** so that it can exchange DVMRP information with routers **A** and **B**.

Figure 6 DVMRP Network Example

- Enables IGMP and DVMRP on the Switch.
- Enables DVMRP on the following routing domains: 10.10.10.1/24, 172.16.1.1/24.
- Displays DVMRP settings configured on the Switch.

```

sysname(config)# router igmp
sysname(config-igmp)# exit
sysname(config)# router dvmrp
sysname(config-dvmrp)# exit
sysname(config)# interface route-domain 10.10.10.1/24
sysname(config-if)# ip dvmrp
sysname(config-if)# exit
sysname(config)# interface route-domain 172.16.1.1/24
sysname(config-if)# ip dvmrp
sysname(config-if)# exit
sysname(config)# exit
sysname# show router dvmrp
  TTL threshold: 50

IP Address      Subnet Mask      Active
-----
10.10.10.1      255.255.255.0    Yes
172.16.1.1     255.255.255.0    Yes
192.168.1.1    255.255.255.0    No

```

Error Disable and Recovery Commands

Use these commands to configure the CPU protection and error disable recovery features on the Switch.

22.1 CPU Protection Overview

Switches exchange protocol control packets in a network to get the latest networking information. If a Switch receives large numbers of control packets, such as ARP, BPDU or IGMP packets, which are to be processed by the CPU, the CPU may become overloaded and be unable to handle regular tasks properly.

The CPU protection feature allows you to limit the rate of ARP, BPDU and IGMP packets to be delivered to the CPU on a port. This enhances the CPU efficiency and protects against potential DoS attacks or errors from other network(s). You then can choose to drop control packets that exceed the specified rate limit or disable a port on which the packets are received.

22.2 Error-Disable Recovery Overview

Some features, such as loop guard or CPU protection, allow the Switch to shut down a port or discard specific packets on a port when an error is detected on the port. For example, if the Switch detects that packets sent out the port(s) loop back to the Switch, the Switch can shut down the port(s) automatically. After that, you need to enable the port(s) or allow the packets on a port manually via the web configurator or the commands. With error-disable recovery, you can set the disabled port(s) to become active or start receiving the packets again after the time interval you specify.

22.3 User Input Values

This section lists the common term definition appears in this chapter.

Table 62 errdisable recovery command user input values

| USER INPUT | DESCRIPTION |
|------------------|--|
| <i>port-list</i> | The port number or a range of port numbers that you want to configure. |

22.4 Command Summary

The following section lists the commands for this feature.

Table 63 cpu-protection Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| interface port-channel <port-list> | Enables a port or a list of ports for configuration. | C | 13 |
| cpu-protection cause <ARP BPDU IGMP> rate-limit <0-256> | Sets the maximum number of ARP, BPDU or IGMP packets that the specified port(s) are allowed to receive or transmit per second. 0 means no rate limit. | C | 13 |
| clear cpu-protection interface port-channel <port-list> cause <ARP BPDU IGMP> | Resets the "Total Drop" counters for the specified port(s) to zero (0). You can see the counter using the show cpu-protection command. The "Total Drops" means the number of ARP, BPDU or IGMP packets that have been dropped due to the Error Disable feature in rate-limitation mode. | E | 13 |
| reset cpu-protection interface port-channel <port-list> cause <ARP BPDU IGMP> | Sets the specified port(s) to handle all ARP, BPDU or IGMP packets in stead of ignoring them, if the port(s) are in inactive-reason mode (set by using the errdisable detet cause command). | E | 13 |
| show cpu-protection interface port-channel <port-list> | Shows the CPU Protection settings and the number of ARP, BPDU and/or IGMP packets that has been dropped by the Error Disable feature for the specified port(s). | E | 13 |

Table 64 errdisable recovery Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| errdisable detect cause <ARP BPDU IGMP> | Sets the Switch to detect if the number of ARP, BPDU or IGMP packets exceeds the rate limit on port(s) (set by using the cpu-protection cause command). | C | 13 |
| errdisable detect cause <ARP BPDU IGMP> mode <inactive-port inactive-reason rate-limitation> | Sets the action that the Switch takes when the number of ARP, BPDU or IGMP packets exceeds the rate limit on port(s). inactive-port: The Switch shuts down the port. inactive-reason: The Switch bypasses the processing of the specified control packets (such as ARP or IGMP packets), or drops all the specified control packets (such as BPDU) on the port. rate-limitation: The Switch drops the additional control packets the port(s) have to handle in every one second. | C | 13 |
| errdisable recovery | Turns on the disabled port recovery function on the Switch. | C | 13 |
| errdisable recovery cause <loopguard ARP BPDU IGMP> | Enables the recovery timer for the specified feature that causes the Switch to shut down port(s). | C | 13 |
| errdisable recovery cause <loopguard ARP BPDU IGMP> interval <30-2592000> | Sets how many seconds the Switch waits before enabling the port(s) which was shut down. | C | 13 |
| no errdisable detect cause <ARP BPDU IGMP> | Disables the rate limit for ARP, BPDU or IGMP packets on port(s), set by using the cpu-protection cause command. | C | 13 |
| no errdisable recovery | Turns off the disabled port recovery function on the Switch. | C | 13 |
| no errdisable recovery cause <loopguard ARP BPDU IGMP> | Disables the recovery timer for the specified feature that causes the Switch to shut down a port. | C | 13 |

Table 64 errdisable recovery Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--------------------------|---|---|----|
| show errdisable | Displays which port(s) are detected (by Error Disable), the mode of the ports, and which packets (ARP, BPDU or IGMP) are being detected. | E | 13 |
| show errdisable detect | Displays the Error Disable settings including the available protocol of packets (ARP, BPDU or IGMP), the current status (enabled or disabled), and the corresponding action the Switch takes when a detected port is handling packets over the limit. | E | 13 |
| show errdisable recovery | Displays the disabled port recovery settings and after how many seconds which port(s) will be activated. | E | 13 |

22.5 Command Examples

This example shows you how to configure the following:

- limit the number of ARP packets that port 7 can handle to 100 packets per second.
- set to shut down port 7 when the number ARP packets the port should handle exceeds the rate limit.
- display the CPU protection settings that you just set for port 7.
- display the Error Disable status and action mode for ARP packet handling.

```

systemname# config
systemname(config)# interface port-channel 7
systemname(config-interface)# cpu-protection cause ARP rate-limit 100
systemname(config-interface)# exit
systemname(config)# errdisable detect cause ARP
systemname(config)# errdisable detect cause ARP mode inactive-port
systemname(config)# exit
systemname# show cpu-protection interface port-channel 7
  Port : 7

Reason          Rate          Mode          Total Drops
-----
  ARP            100           inactive-port  -
  BPDU            0             inactive-port  -
  IGMP            0             inactive-port  -

systemname# show errdisable detect

Reason          Status          Mode
-----
  ARP            enable          inactive-port
  BPDU            enable          rate-limitation
  IGMP            enable          inactive-port
systemname#

```

This example enables the disabled port recovery function and the recovery timer for the loopguard feature on the Switch. If a port is shut down due to the specified reason, the Switch activates the port 300 seconds (the default value) later. This example also shows the number of the disabled port(s) and the time left before the port(s) becomes active.

```

sysname# configure
sysname(config)# errdisable recovery
sysname(config)# errdisable recovery cause loopguard
sysname(config)# exit
sysname# show errdisable recovery
  Errdisable Recovery Status:Enable

Reason          Timer Status      Time
-----          -
loopguard       Enable            300
  ARP           Disable           300
  BPDU          Disable           300
  IGMP          Disable           300

Interfaces that will be enabled at the next timeout:

Interface      Reason           Time left(sec)   Mode
-----
sysname#

```

Ethernet OAM Commands

Use these commands to use the link monitoring protocol IEEE 802.3ah Link Layer Ethernet OAM (Operations, Administration and Maintenance).

23.1 IEEE 802.3ah Link Layer Ethernet OAM Implementation

Link layer Ethernet OAM (Operations, Administration and Maintenance) as described in IEEE 802.3ah is a link monitoring protocol. It utilizes OAM Protocol Data Units or OAM PDU's to transmit link status information between directly connected Ethernet devices. Both devices must support IEEE 802.3ah. Because link layer Ethernet OAM operates at layer two of the OSI (Open Systems Interconnection Basic Reference) model, neither IP or SNMP are necessary to monitor or troubleshoot network connection problems.

The Switch supports the following IEEE 802.3ah features:

- **Discovery** - this identifies the devices on each end of the Ethernet link and their OAM configuration.
- **Remote Loopback** - this can initiate a loopback test between Ethernet devices.

23.2 Command Summary

The following section lists the commands for this feature.

Table 65 ethernet oam Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show ethernet oam discovery <port-list></code> | Displays OAM configuration details and operational status of the specified ports. | E | 3 |
| <code>show ethernet oam statistics <port-list></code> | Displays the number of OAM packets transferred for the specified ports. | E | 3 |
| <code>show ethernet oam summary</code> | Displays the configuration details of each OAM activated port. | E | 3 |
| <code>ethernet oam</code> | Enables Ethernet OAM on the Switch. | C | 13 |
| <code>no ethernet oam</code> | Disables Ethernet OAM on the Switch. | C | 13 |
| <code>ethernet oam remote-loopback start <port></code> | Initiates a remote-loopback test from the specified port by sending Enable Loopback Control PDUs to the remote device. | E | 13 |
| <code>ethernet oam remote-loopback stop <port></code> | Terminates a remote-loopback test from the specified port by sending Disable Loopback Control PDUs to the remote device. | E | 13 |

Table 65 ethernet oam Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| ethernet oam remote-loopback test <port> [<number-of-packets> [<packet-size>]] | Performs a remote-loopback test from the specified port. You can also define the allowable packet number and packet size of the loopback test frames. | E | 13 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |
| ethernet oam | Enables Ethernet OAM on the port(s). | C | 13 |
| no ethernet oam | Disables Ethernet OAM on the port(s). | C | 13 |
| ethernet oam mode <active passive> | Specifies the OAM mode on the ports. active: Allows the port to issue and respond to Ethernet OAM commands. passive: Allows the port to respond to Ethernet OAM commands. | C | 13 |
| ethernet oam remote-loopback ignore-rx | Sets the Switch to ignore loopback commands received on the ports. | C | 13 |
| ethernet oam remote-loopback supported | Enables the remote loopback feature on the ports. | C | 13 |
| no ethernet oam remote-loopback ignore-rx | Sets the Switch to process loopback commands received on the ports. | C | 13 |
| no ethernet oam remote-loopback supported | Disables the remote loopback feature on the ports. | C | 13 |
| no ethernet oam mode | Resets the OAM mode to the default value. | C | 13 |

23.3 Command Examples

This example enables Ethernet OAM on port 7 and sets the mode to active.

```

sysname# configure
sysname(config)# ethernet oam
sysname(config)# interface port-channel 7
sysname(config-interface)# ethernet oam
sysname(config-interface)# ethernet oam mode active
sysname(config-interface)# exit
sysname(config)# exit

```

This example performs Ethernet OAM discovery from port 7.

```

sysname# show ethernet oam discovery 7
Port 7
Local client
-----
OAM configurations:
  Mode                : Active
  Unidirectional      : Not supported
  Remote loopback     : Not supported
  Link events         : Not supported
  Variable retrieval  : Not supported
  Max. OAMPDU size   : 1518

Operational status:
  Link status         : Down
  Info. revision      : 3
  Parser state        : Forward
  Discovery state     : Active Send Local

```

The following table describes the labels in this screen.

Table 66 show ethernet oam discovery

| LABEL | DESCRIPTION |
|--------------------|--|
| OAM configurations | The remote device uses this information to determine what functions are supported. |
| Mode | This field displays the OAM mode. The device in active mode (typically the service provider's device) controls the device in passive mode (typically the subscriber's device). Active: The Switch initiates OAM discovery; sends information PDUs; and may send event notification PDUs, variable request/response PDUs, or loopback control PDUs. Passive: The Switch waits for the remote device to initiate OAM discovery; sends information PDUs; may send event notification PDUs; and may respond to variable request PDUs or loopback control PDUs. The Switch might not support some types of PDUs, as indicated in the fields below. |
| Unidirectional | This field indicates whether or not the Switch can send information PDUs to transmit fault information when the receive path is non-operational. |
| Remote loopback | This field indicates whether or not the Switch can use loopback control PDUs to put the remote device into loopback mode. |
| Link events | This field indicates whether or not the Switch can interpret link events, such as link fault and dying gasp. Link events are sent in event notification PDUs and indicate when the number of errors in a given interval (time, number of frames, number of symbols, or number of errored frame seconds) exceeds a specified threshold. Organizations may create organization-specific link event TLVs as well. |
| Variable retrieval | This field indicates whether or not the Switch can respond to requests for more information, such as requests for Ethernet counters and statistics, about link events. |
| Max. OAMPDU size | This field displays the maximum size of PDU for receipt and delivery. |
| Operational status | |
| Link status | This field indicates that the link is up or down. |

Table 66 show ethernet oam discovery (continued)

| LABEL | DESCRIPTION |
|-----------------|--|
| Info. revision | This field displays the current version of local state and configuration. This two-octet value starts at zero and increments every time the local state or configuration changes. |
| Parser state | This field indicates the current state of the parser. Forward: The packet is forwarding packets normally. Loopback: The Switch is in loopback mode. Discard: The Switch is discarding non-OAMPDUs because it is trying to or has put the remote device into loopback mode. |
| Discovery state | This field indicates the state in the OAM discovery process. OAM-enabled devices use this process to detect each other and to exchange information about their OAM configuration and capabilities. OAM discovery is a handshake protocol. Fault: One of the devices is transmitting OAM PDUs with link fault information, or the interface is not operational. Active Send Local: The Switch is in active mode and is trying to see if the remote device supports OAM. Passive Wait: The Switch is in passive mode and is waiting for the remote device to begin OAM discovery. Send Local Remote: This state occurs in the following circumstances. <ul style="list-style-type: none"> The Switch has discovered the remote device but has not accepted or rejected the connection yet. The Switch has discovered the remote device and rejected the connection. Send Local Remote OK: The Switch has discovered the remote device and has accepted the connection. In addition, the remote device has not accepted or rejected the connection yet, or the remote device has rejected the connection. Send Any: The Switch and the remote device have accepted the connection. This is the operating state for OAM links that are fully operational. |

This example looks at the number of OAM packets transferred on port 1.

```

sysname# show ethernet oam statistics 1
Port 1
Statistics:
-----
Information OAMPDU Tx      : 0
Information OAMPDU Rx      : 0
Event Notification OAMPDU Tx : 0
Event Notification OAMPDU Rx : 0
Loopback Control OAMPDU Tx  : 0
Loopback Control OAMPDU Rx  : 0
Variable Request OAMPDU Tx  : 0
Variable Request OAMPDU Rx  : 0
Variable Response OAMPDU Tx : 0
Variable Response OAMPDU Rx : 0
Unsupported OAMPDU Tx       : 0
Unsupported OAMPDU Rx       : 0

```

The following table describes the labels in this screen.

Table 67 show ethernet oam statistics

| LABEL | DESCRIPTION |
|------------------------------|---|
| Information OAMPDU Tx | This field displays the number of OAM PDUs sent on the port. |
| Information OAMPDU Rx | This field displays the number of OAM PDUs received on the port. |
| Event Notification OAMPDU Tx | This field displays the number of unique or duplicate OAM event notification PDUs sent on the port. |
| Event Notification OAMPDU Rx | This field displays the number of unique or duplicate OAM event notification PDUs received on the port. |
| Loopback Control OAMPDU Tx | This field displays the number of loopback control OAM PDUs sent on the port. |
| Loopback Control OAMPDU Rx | This field displays the number of loopback control OAM PDUs received on the port. |
| Variable Request OAMPDU Tx | This field displays the number of OAM PDUs sent to request MIB objects on the remote device. |
| Variable Request OAMPDU Rx | This field displays the number of OAM PDUs received requesting MIB objects on the Switch. |
| Variable Response OAMPDU Tx | This field displays the number of OAM PDUs sent by the Switch in response to requests. |
| Variable Response OAMPDU Rx | This field displays the number of OAM PDUs sent by the remote device in response to requests. |
| Unsupported OAMPDU Tx | This field displays the number of unsupported OAM PDUs sent on the port. |
| Unsupported OAMPDU Rx | This field displays the number of unsupported OAM PDUs received on the port. |

This example looks at the configuration of ports on which OAM is enabled.

```

sysname# show ethernet oam summary

OAM Config: U : Unidirection, R : Remote Loopback
             L : Link Events , V : Variable Retrieval

      Local          Remote
-----
Port  Mode   MAC Addr          OUI   Mode   Config
-----
1     Active

```

The following table describes the labels in this screen.

Table 68 show ethernet oam summary

| LABEL | DESCRIPTION |
|----------|--|
| Local | This section displays information about the ports on the Switch. |
| Port | This field displays the port number. |
| Mode | This field displays the operational state of the port. |
| Remote | This section displays information about the remote device. |
| MAC Addr | This field displays the MAC address of the remote device. |

Table 68 show ethernet oam summary (continued)

| LABEL | DESCRIPTION |
|--------|---|
| OUI | This field displays the OUI (first three bytes of the MAC address) of the remote device. |
| Mode | This field displays the operational state of the remote device. |
| Config | This field displays the capabilities of the Switch and remote device. The capabilities are identified in the OAM Config section. |

External Alarm Commands

Use these commands to configure the external alarm features on the Switch.

24.1 Command Summary

The following section lists the commands for this feature.

Table 69 external-alarm Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>external-alarm <index> name <name_string></code> | Sets the name of the specified external alarm. <i>index</i> : 1 ~ 4 <i>name_string</i> : Enters a name of up to 32 ASCII characters. | C | 13 |
| <code>no external-alarm <index></code> | Removes the name of the specified external alarm. | C | 13 |
| <code>no external-alarm all</code> | Removes the name of all external alarms. | C | 13 |
| <code>show external-alarm</code> | Displays external alarm settings and status. | E | 13 |

24.2 Command Examples

This example configures and shows the name and status of the external alarm(s).

```
sysname# configure
sysname(config)# external-alarm 1 name dooropen
sysname(config)# exit
sysname# show external-alarm
External Alarm 1

                Status: Not asserted
                Name: dooropen

External Alarm 2

                Status: Not asserted
                Name:

External Alarm 3

                Status: Not asserted
                Name:

External Alarm 4

                Status: Not asserted
                Name:
sysname#
```

GARP Commands

Use these commands to configure GARP.

25.1 GARP Overview

Switches join VLANs by making a declaration. A declaration is made by issuing a Join message using GARP. Declarations are withdrawn by issuing a Leave message. A Leave All message terminates all registrations. GARP timers set declaration timeout values.

25.2 Command Summary

The following section lists the commands for this feature.

Table 70 garp Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| show garp | Displays GARP information. | E | 3 |
| garp join <100-65535> leave <200-65535> leaveall <200-65535> | Configures GARP time settings (in milliseconds), including the join, leave and leave all timers for each port. Leave Time must be at least two times larger than Join Timer, and Leave All Timer must be larger than Leave Timer. | C | 13 |

25.3 Command Examples

In this example, the administrator looks at the Switch's GARP timer settings and decides to change them. The administrator sets the Join Timer to 300 milliseconds, the Leave Timer to 800 milliseconds, and the Leave All Timer to 11000 milliseconds.

```
sysname# show garp

GARP Timer
-----
Join   Timer       :200
Leave   Timer       :600
Leave   All Timer   :10000
sysname# configure
sysname(config)# garp join 300 leave 800 leaveall 11000
sysname(config)# exit
sysname# show garp

GARP Timer
-----
Join   Timer       :300
Leave   Timer       :800
Leave   All Timer   :11000
```

Green Ethernet Commands

Use these commands to configure green Ethernet.

26.1 Green Ethernet Overview

Green Ethernet reduces Switch port power consumption in the following ways.

- IEEE 802.3az Energy Efficient Ethernet (EEE)
If EEE is enabled, both sides of a link support EEE and there is no traffic, the port enters Low Power Idle (LPI) mode. LPI mode turns off some functions of the physical layer (becomes quiet) to save power. Periodically the port transmits a REFRESH signal to allow the link partner keep the link alive. When there is traffic to be sent, a WAKE signal is sent to the link partner to return the link to active mode.
- Auto Power Down
Auto Power Down turns off almost all functions of the port's physical layer functions when the link is down, so the port only uses power to check for a link up pulse from the link partner. After the link up pulse is detected, the port wakes up from Auto Power Down and operates normally.
- Short Reach
Traditional Ethernet transmits all data with enough power to reach the maximum cable length. Shorter cables lose less power, so Short Reach saves power by adjusting the transmit power of each port according to the length of cable attached to that port.



Not all Switches supports Green Ethernet completely. Some may only support EEE.

First configure Green Ethernet on the Switch, then configure it on an interface.

26.2 Command Summary

The following section lists the commands for this feature.

Table 71 green-ethernet Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>green-ethernet auto-power-down</code> | Enables automatic power down on the Switch. | E | 13 |
| <code>no green-ethernet auto-power-down</code> | Disables automatic power down on the Switch. | E | 13 |
| <code>green-ethernet eee</code> | Enables IEEE 802.3az Energy Efficient Ethernet on the Switch. | E | 13 |
| <code>no green-ethernet eee</code> | Disables eee on the Switch. | E | 13 |
| <code>green-ethernet short-reach</code> | Enables adjusting the transmission power of each port according to the length of cable attached to a port on the Switch. | E | 13 |
| <code>no green-ethernet short-reach</code> | Disables short-reach on the Switch. | E | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>green-ethernet auto-power-down</code> | Enables automatic power down on the specified port(s). | C | 13 |
| <code>no green-ethernet auto-power-down</code> | Disables automatic power down on the specified port(s). | C | 13 |
| <code>green-ethernet eee</code> | Enables IEEE 802.3az Energy Efficient Ethernet on the the specified port(s). | C | 13 |
| <code>no green-ethernet eee</code> | Disable IEEE 802.3az Energy Efficient Ethernet on the the specified port(s). | C | 13 |
| <code>green-ethernet short-reach</code> | Enables adjusting the transmit power of the specified port(s) according to the length of cable attached to the port. | C | 13 |
| <code>no green-ethernet short-reach</code> | Disables adjusting the transmit power of the specified port(s) according to the length of cable attached to the port. | C | 13 |
| <code>show green-ethernet auto-power-down</code> | Shows automatic power down information. | E | 3 |
| <code>show green-ethernet eee</code> | Shows Energy Efficient Ethernet information. | E | 3 |
| <code>show green-ethernet short-reach</code> | Shows short reach information. | E | 3 |

26.3 Green Ethernet Command Example

In this example, the Switch supports EEE and auto power down per port, and short reach globally. The following are explanations of the Status parameters:

EEE

- Active displays when EEE is enabled and the EEE port is up
- Inactive displays when EEE is enabled but the EEE port is down or the device connected to this port does not support EEE
- Unsupported means the Switch cannot display the status.
- - means EEE is not enabled

Auto power down

- Normal means auto power down has not reduced the power on this link
- Power down means auto power down has reduced the power on this link
- Unsupported means the Switch cannot display the status.
- - means auto power down is not enabled

Short reach

- Normal means short reach has not reduced the power on this link
- Low power means short reach has reduced the power on this link
- Unsupported means the Switch cannot display the status.
- - means short reach is not enabled

```

sysname# configure
sysname(config)# green-ethernet eee
sysname(config)# green-ethernet short-reach
sysname(config)# green-ethernet auto-power-down
sysname(config)# interface port-channel 1-4
sysname(config-interface)# green-ethernet eee
sysname(config-interface)# green-ethernet auto-power-down
sysname(config-interface)# exit
sysname(config)# exit
sysname# show green-ethernet eee
  EEE globally configuration : Enable

Port  Port status      Config  Status
----  -
  1    100M/F          Enable  Active
  2    Down            Enable  Inactive
  3    100M/F          Enable  Unsupported
  4    Down            Disable -

sysname# show green-ethernet auto-power-down
  Auto Power Down globally configuration : Enable

Port  Config  Status
----  -
  1    Enable  Power down
  2    Enable  Normal
  3    Enable  Unsupported
  4    Disable -

sysname# show green-ethernet short-reach
  Short Reach globally configuration : Enable

sysname#

```

The following example shows how to configure short reach if the Switch supports short reach per port

```
sysname# configure
sysname(config)# green-ethernet short-reach

sysname# configure
sysname(config)# interface port-channel 1-4
sysname(config-interface)# green-ethernet short-reach
```

The following example shows the display for short reach if the Switch supports short reach per port and showing the status

```
sysname# show green-ethernet short-reach
Global configuration : Enable

Port  Config      Status
----  -
  1   Enable      Low power
  2   Disable     -
  3   Enable      Unsupported
  4   Enable      Normal
```

GVRP Commands

Use these commands to configure GVRP.

27.1 Command Summary

The following section lists the commands for this feature.

Table 72 gvrp Command Summary

| COMMAND | DESCRIPTION | M | P |
|------------------------------------|--|---|----|
| show vlan1q gvrp | Displays GVRP settings. | E | 13 |
| vlan1q gvrp | Enables GVRP. | C | 13 |
| no vlan1q gvrp | Disables GVRP on the Switch. | C | 13 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |
| gvrp | Enables this function to permit VLAN groups beyond the local Switch. | C | 13 |
| no gvrp | Disable GVRP on the port(s). | C | 13 |

27.2 Command Examples

This example shows the Switch's GVRP settings.

```
sysname# show vlan1q gvrp

GVRP Support
-----
gvrpEnable = YES
gvrpPortEnable:
```

This example turns off GVRP on ports 1-5.

```
sysname# configure
sysname(config)# interface port-channel 1-5
sysname(config-interface)# no gvrp
sysname(config-interface)# exit
sysname(config)# exit
```

PART III

Reference H-M

[HTTPS Server Commands \(105\)](#)
[IEEE 802.1x Authentication Commands \(109\)](#)
[IGMP and Multicasting Commands \(112\)](#)
[IGMP Snooping Commands \(115\)](#)
[IGMP Filtering Commands \(122\)](#)
[Interface Commands \(124\)](#)
[Interface Route-domain Mode \(129\)](#)
[IP Commands \(130\)](#)
[IP Source Binding Commands \(135\)](#)
[IPv6 Commands \(137\)](#)
[Layer 2 Protocol Tunnel \(L2PT\) Commands \(162\)](#)
[Link Layer Discovery Protocol \(LLDP\) Commands \(165\)](#)
[Load Sharing Commands \(177\)](#)
[Logging Commands \(179\)](#)
[Login Account Commands \(180\)](#)
[Loopguard Commands \(181\)](#)
[MAC Address Commands \(183\)](#)
[MAC Authentication Commands \(185\)](#)
[MAC Filter Commands \(189\)](#)
[MAC Forward Commands \(191\)](#)
[MAC Pinning Commands \(192\)](#)
[Mirror Commands \(194\)](#)
[MRSTP Commands \(198\)](#)

MSTP Commands (201)
Multiple Login Commands (206)
MVR Commands (207)

HTTPS Server Commands

Use these commands to configure the HTTPS server on the Switch.

28.1 Command Summary

The following section lists the commands for this feature.

Table 73 https Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show https</code> | Displays the HTTPS settings, statistics, and sessions. | E | 3 |
| <code>show https certificate</code> | Displays the HTTPS certificates. | E | 3 |
| <code>show https key <rsa dsa></code> | Displays the HTTPS key. | E | 3 |
| <code>show https session</code> | Displays current HTTPS session(s). | E | 3 |
| <code>https cert-regeneration <rsa dsa></code> | Re-generates a certificate. | C | 13 |

28.2 Command Examples

This example shows the current HTTPS settings, statistics, and sessions.

```

sysname# show https
Configuration
  Version                : SSLv3, TLSv1
  Maximum session number:   64 sessions
  Maximum cache number  :   128 caches
  Cache timeout         :   300 seconds
  Support ciphers       :
                        DHE-RSA-AES256-SHA DHE-DSS-AES256-SHA AES256-SHA EDH-RSA-DES-
CBC3-SHA
                        EDH-DSS-DES-CBC3-SHA DES-CBC3-SHA DES-CBC3-MD5 DHE-RSA-AES128-SHA
                        DHE-DSS-AES128-SHA AES128-SHA DHE-DSS-RC4-SHA IDEA-CBC-SHA RC4-
SHA
                        RC4-MD5 IDEA-CBC-MD5 RC2-CBC-MD5 RC4-MD5

Statistics:
  Total connects          :      0
  Current connects        :      0
  Connects that finished:      0
  Renegotiate requested  :      0
  Session cache items    :      0
  Session cache hits     :      0
  Session cache misses   :      0
  Session cache timeouts:      0

Sessions:
  Remote IP              Port   Local IP                Port   SSL bytes  Sock bytes

```

The following table describes the labels in this screen.

Table 74 show https

| LABEL | DESCRIPTION |
|------------------------|--|
| Configuration | |
| Version | This field displays the current version of SSL (Secure Sockets Layer) and TLS (Transport Layer Security). |
| Maximum session number | This field displays the maximum number of HTTPS sessions the Switch supports. |
| Maximum cache number | This field displays the maximum number of entries in the cache table the Switch supports for HTTPS sessions. |
| Cache timeout | This field displays how long entries remain in the cache table before they expire. |
| Support ciphers | This field displays the SSL or TLS cipher suites the Switch supports for HTTPS sessions. The cipher suites are identified by their OpenSSL equivalent names. If the name does not include the authentication used, assume RSA authentication. See SSL v2.0, SSL v3.0, TLS v1.0, and RFC 3268 for more information. |
| Statistics | |
| Total connects | This field displays the total number of HTTPS connections since the Switch started up. |
| Current connects | This field displays the current number of HTTPS connections. |

Table 74 show https (continued)

| LABEL | DESCRIPTION |
|------------------------|--|
| Connects that finished | This field displays the number of HTTPS connections that have finished. |
| Renegotiate requested | This field displays the number of times the Switch requested clients to renegotiate the SSL connection parameters. |
| Session cache items | This field displays the current number of items in cache. |
| Session cache hits | This field displays the number of times the Switch used cache to satisfy a request. |
| Session cache misses | This field displays the number of times the Switch could not use cache to satisfy a request. |
| Session cache timeouts | This field displays the number of items that have expired in the cache. |
| Sessions | |
| Remote IP | This field displays the client's IP address in this session. |
| Port | This field displays the client's port number in this session. |
| Local IP | This field displays the Switch's IP address in this session. |
| Port | This field displays the Switch's port number in this session. |
| SSL bytes | This field displays the number of bytes encrypted or decrypted by the Secure Socket Layer (SSL). |
| Sock bytes | This field displays the number of bytes encrypted or decrypted by the socket. |

This example shows the current HTTPS sessions.

```

sysname# show https session
SSL-Session:
  Protocol   : SSLv3
  Cipher    : RC4-MD5
  Session-ID:
68BFB25BF3F0F15AB7B038EAB6BACE4AB7A4A6A5280E55943B7191057C96
  Session-ID-ctx: 7374756E6E656C20534944
  Master-Key:
65C110D9BD9BB0EE36CE0C76408C121DAFD1E5E3209614EB0AC5509CDB60D0904937DA4B
A5BA058B57FD7169ACDD4ACF
  Key-Arg    : None
  Start Time: 2252
  Timeout    : 300 (sec)
  Verify return code: 0 (ok)

```

The following table describes the labels in this screen.

Table 75 show https session

| LABEL | DESCRIPTION |
|----------------|--|
| Protocol | This field displays the SSL version used in the session. |
| Cipher | This field displays the encryption algorithms used in the session. |
| Session-ID | This field displays the session identifier. |
| Session-ID-ctx | This field displays the session ID context, which is used to label the data and cache in the sessions and to ensure sessions are only reused in the appropriate context. |
| Master-Key | This field displays the SSL session master key. |

Table 75 show https session (continued)

| LABEL | DESCRIPTION |
|--------------------|---|
| Key-Arg | This field displays the key argument that is used in SSLv2. |
| Start Time | This field displays the start time (in seconds, represented as an integer in standard UNIX format) of the session. |
| Timeout | This field displays the timeout for the session. If the session is idle longer than this, the Switch automatically disconnects. |
| Verify return code | This field displays the return code when an SSL client certificate is verified. |

IEEE 802.1x Authentication Commands

Use these commands to configure IEEE 802.1x authentication.



Do not forget to configure the authentication server.

29.1 Guest VLAN Overview

When 802.1x port authentication is enabled on the Switch and its ports, clients that do not have the correct credentials are blocked from using the port(s). You can configure your Switch to have one VLAN that acts as a guest VLAN. If you enable the guest VLAN on a port, the user that is not IEEE 802.1x capable or fails to enter the correct username and password can still access the port, but traffic from the user is forwarded to the guest VLAN. That is, unauthenticated users can have access to limited network resources in the same guest VLAN, such as the Internet. The rights granted to the guest VLAN depends on how the network administrator configures switches or routers with the guest network feature.

29.2 Command Summary

The following section lists the commands for this feature.

Table 76 port-access-authenticator Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>no port-access-authenticator</code> | Disables port authentication on the Switch. | C | 13 |
| <code>no port-access-authenticator <port-list></code> | Disables authentication on the listed ports. | C | 13 |
| <code>no port-access-authenticator <port-list> reauthenticate</code> | Disables the re-authentication mechanism on the listed port(s). | C | 13 |
| <code>no port-access-authenticator <port-list> guest-vlan</code> | Disables the guest VLAN feature on the listed ports. | C | 13 |
| <code>no port-access-authenticator <port-list> guest-vlan Host-mode</code> | Resets the guest VLAN host-mode to its default settings (Multi-host). | C | 13 |
| <code>port-access-authenticator</code> | Enables 802.1x authentication on the Switch. | C | 13 |

Table 76 port-access-authenticator Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| port-access-authenticator <port-list> | Enables 802.1x authentication on the specified port(s). | C | 13 |
| port-access-authenticator <port-list> guest-vlan | Enables the guest VLAN feature on the listed ports. | C | 13 |
| port-access-authenticator <port-list> guest-vlan <vlan-id> | Sets the guest VLAN ID number on the listed ports. | C | 13 |
| port-access-authenticator <port-list> guest-vlan Host-mode Multi-host | Sets the Switch to authenticate only the first client that connects to the listed ports. If the first user enters the correct credential, any other users are allowed to access the port without authentication. Otherwise, they are all put in the guest VLAN. Once the first user who did authentication logs out or disconnects from the port, rest of the users are blocked until a user does the authentication process again. | C | 13 |
| port-access-authenticator <port-list> guest-vlan Host-mode Multi-secure [<1-24>] | Sets the Switch to authenticate each client that connects to the listed ports. Optionally, sets the maximum number of the clients that the Switch authenticates on the port(s). The maximum number supported varies by Switch (24 in this example). | C | 13 |
| port-access-authenticator <port-list> max-req <1-10> | Sets the number of times the Switch tries to authenticate client(s) before sending unresponsive ports to the guest VLAN. | C | 13 |
| port-access-authenticator <port-list> quiet-period <0-65535> | Sets the number of seconds the port(s) remains in the HELD state and rejects further authentication requests from the client after a failed authentication exchange. | C | 13 |
| port-access-authenticator <port-list> supp-timeout <30-65535> | Sets the number of seconds the Switch waits for client's response to the challenge request before sending a request again. | C | 13 |
| port-access-authenticator <port-list> tx-period <1-65535> | Sets the number of seconds the Switch waits before re-sending an identity request to clients on the listed ports. | C | 13 |
| port-access-authenticator <port-list> reauthenticate | Sets a subscriber to periodically re-enter his or her username and password to stay connected to a specified port. | C | 13 |
| port-access-authenticator <port-list> reauth-period <1-65535> | Specifies how often (in seconds) a client has to re-enter the username and password to stay connected to the specified port(s). | C | 13 |
| show port-access-authenticator | Displays all port authentication settings. | E | 3 |
| show port-access-authenticator <port-list> | Displays port authentication settings on the specified port(s). | E | 3 |

29.3 Command Examples

This example configures the Switch in the following ways:

- 1 Specifies RADIUS server 1 with IP address 10.10.10.1, port 1890 and the string **secretKey** as the password.
- 2 Specifies the timeout period of 30 seconds that the Switch will wait for a response from the RADIUS server.
- 3 Enables port authentication on the Switch.

- 4 Enables port authentication on ports 4 to 8.
- 5 Activates reauthentication on ports 4-8.
- 6 Specifies 1800 seconds as the interval for client reauthentication on ports 4-8.

```

sysname(config)# radius-server host 1 10.10.10.1 auth-port 1890 key
--> secretKey
sysname(config)# radius-server timeout 30
sysname(config)# port-access-authenticator
sysname(config)# port-access-authenticator 4-8
sysname(config)# port-access-authenticator 4-8 reauthenticate
sysname(config)# port-access-authenticator 4-8 reauth-period 1800

```

This example configures the Switch in the following ways:

- 1 Enables the guest VLAN feature on port 8.
- 2 Puts port 8 in guest VLAN 200.
- 3 Sets host mode to multi-secure to have the Switch authenticate each client that connects to port 8.

```

sysname(config)# port-access-authenticator 8 guest-vlan
sysname(config)# port-access-authenticator 8 guest-vlan 200
sysname(config)# port-access-authenticator 8 guest-vlan Host-mode Multi-secure

```

This example configures the Switch in the following ways:

- 1 Disables authentication on the Switch.
- 2 Disables re-authentication on ports 1, 3, 4, and 5.
- 3 Disables authentication on ports 1, 6, and 7.

```

sysname(config)# no port-access-authenticator
sysname(config)# no port-access-authenticator 1,3-5 reauthenticate
sysname(config)# no port-access-authenticator 1,6-7

```

IGMP and Multicasting Commands

This chapter explains how to use commands to configure the Internet Group Membership Protocol (IGMP) on the Switch. It also covers configuring the ports to remove the VLAN tag from outgoing multicast packets on the Switch.

30.1 IGMP Overview

The Switch supports IGMP version 1 (**IGMP-v1**), version 2 (**IGMP-v2**) and IGMP version 3 (**IGMP-v3**). Refer to RFC 1112, RFC 2236 and RFC 3376 for information on IGMP versions 1, 2 and 3 respectively. At start up, the Switch queries all directly connected networks to gather group membership. After that, the Switch periodically updates this information.

30.2 Command Summary

The following section lists the commands for this feature.

Table 77 IGMP Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>router igmp</code> | Enables and enters the IGMP configuration mode. | C | 13 |
| <code>exit</code> | Leaves the IGMP configuration mode. | C | 13 |
| <code>non-querier</code> | Sets the Switch to Non-Querier mode. (If the Switch discovers a multicast router with a lower IP address, it will stop sending Query messages on that network.) | C | 13 |
| <code>no non-querier</code> | Disables non-querier mode on the Switch, (the multicast router always sends Query messages). | C | 13 |
| <code>unknown-multicast-frame <drop flooding></code> | Specifies the action the Switch should perform when it receives unknown multicast frames. | C | 13 |
| <code>no router igmp</code> | Disables IGMP on the Switch. | C | 13 |
| <code>interface route-domain <ip-address>/<mask- bits></code> | Enters the configuration mode for the specified routing domain. | C | 13 |
| <code>ip igmp <v1 v2 v3></code> | Enables IGMP in this routing domain and specifies the version of the IGMP packets that the Switch should use. | C | 13 |

Table 77 IGMP Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>ip igmp robustness-variable <2-255></code> | Sets the IGMP robustness variable on the Switch. This variable specifies how susceptible the subnet is to lost packets. | C | 13 |
| <code>ip igmp query-interval <1-65535></code> | Sets the IGMP query interval on the Switch. This variable specifies the amount of time in seconds between general query messages sent by the router. | C | 13 |
| <code>ip igmp query-max-response-time <1-25></code> | Sets the maximum time that the router waits for a response to a general query message. | C | 13 |
| <code>ip igmp last-member-query-interval <1-25></code> | Sets the amount of time in seconds that the router waits for a response to a group specific query message. | C | 13 |
| <code>no ip igmp</code> | Disables IP IGMP in this routing domain. | C | 13 |
| <code>show ip igmp group</code> | Displays the multicast groups learned by IGMP. | E | 3 |
| <code>show ip igmp interface</code> | Displays the IGMP status information per interface. | E | 3 |
| <code>show ip igmp multicast</code> | Displays the multicast traffic information. | E | 3 |
| <code>show ip igmp timer</code> | Displays the IGMP timer settings. | E | 3 |
| <code>show router igmp</code> | Displays global IGMP settings. | E | 3 |

Table 78 IPMC Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>ipmc egress-untag-vlan <vlan-id></code> | Sets the Switch to remove the VLAN tag from IP multicast packets belonging to the specified VLAN before transmission on this port. Enter a VLAN group ID in this field. Enter 0 to set the Switch not to remove any VLAN tags from the packets. | C | 13 |
| <code>no ipmc egress-untag-vlan</code> | Disables the ports from removing the VLAN tags from outgoing IP multicast packets. | C | 13 |

30.3 Command Examples

This example configures IGMP on the Switch with the following settings:

- Sets the Switch to flood unknown multicast frames.
- Sets the Switch to non-querier mode.

- Configures the IP interface **172.16.1.1** with subnet mask **255.255.255.0** to route IGMP version **3** packets.

```
sysname(config)# router igmp
sysname(config-igmp)# non-querier
sysname(config-igmp)# unknown-multicast-frame flooding
sysname(config-igmp)# exit
sysname(config)# interface route-domain 172.16.1.1/24
sysname(config-if)# ip igmp v3
```

IGMP Snooping Commands

Use these commands to configure IGMP snooping on the Switch.

31.1 Command Summary

The following section lists the commands for this feature.

Table 79 igmp-flush Command Summary

| COMMAND | DESCRIPTION | M | P |
|------------|--|---|----|
| igmp-flush | Removes all multicast group information. | E | 13 |

Table 80 igmp-snooping Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| clear igmp-snooping statistics all | Removes all multicast statistics of the Switch. | E | 3 |
| clear igmp-snooping statistics port | Removes the multicast statistics of the port(s). | E | 3 |
| clear igmp-snooping statistics system | Removes the multicast statistics of the Switch. | E | 3 |
| clear igmp-snooping statistics vlan | Removes the multicast statistics of the multicast VLAN(s) | E | 3 |
| igmp-snooping | Enables IGMP snooping. | C | 13 |
| no igmp-snooping | Disables IGMP snooping. | C | 13 |
| igmp-snooping 8021p-priority <0-7> | Sets the 802.1p priority for outgoing igmp snooping packets. | C | 13 |
| no igmp-snooping 8021p-priority | Disables changing the priority of outgoing IGMP control packets. | C | 13 |
| igmp-snooping authentication-timeout <0-3000> | Sets how long the Switch waits before sending the same access request again if the AAA server rejects the host's request to join a multicast group. | C | 13 |
| no igmp-snooping authentication-timeout | Resets the authentication timeout value to its default setting. | C | 13 |
| igmp-snooping filtering | Enables IGMP filtering on the Switch. Ports can only join multicast groups specified in their IGMP filtering profile. | C | 13 |
| igmp-snooping filtering profile <name> start-address <ip> end-address <ip> | Sets the range of multicast address(es) in a profile. <i>name</i> : 1-32 alphanumeric characters | C | 13 |
| no igmp-snooping filtering | Disables IGMP filtering on the Switch. | C | 13 |

Table 80 igmp-snooping Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| no igmp-snooping filtering profile <name> | Removes the specified IGMP filtering profile. You cannot delete an IGMP filtering profile that is assigned to any ports. | C | 13 |
| no igmp-snooping filtering profile <name> start-address <ip> end-address <ip> | Clears the specified rule of the specified IGMP filtering profile. | C | 13 |
| igmp-snooping host-timeout <1-16711450> | Sets the host timeout value. | C | 13 |
| igmp-snooping leave-timeout <1-16711450> | Sets the leave timeout value | C | 13 |
| igmp-snooping querier | Enables the IGMP snooping querier on the Switch. | C | 13 |
| no igmp-snooping querier | Disables the IGMP snooping querier on the Switch. | C | 13 |
| igmp-snooping leave-proxy | Enables IGMP snooping leave-proxy mode. In this mode, the Switch sends a leave message with its MAC address to the multicast router/switch only when it receives the leave message from the last host in a multicast group. | C | 13 |
| no igmp-snooping leave-proxy | Disables IGMP snooping leave-proxy mode. In this mode, the Switch just snoops on and sends the multicast router/switch all IGMP leave messages without changing their source MAC addresses. | C | 13 |
| igmp-snooping report-proxy | Enables IGMP snooping report-proxy mode. In this mode, the Switch acts as an IGMP v1/v2 report proxy. The Switch not only checks IGMP packets between multicast routers/switches and multicast hosts to learn the multicast group membership, but also replaces the source MAC address in an IGMP v1/v2 report with its own MAC address before forwarding to the multicast router/switch. When the Switch receives more than one IGMP v1/v2 join reports that request to join the same multicast group, it only sends a new join report with its MAC address. This helps reduce the number of multicast join reports passed to the multicast router/switch. | C | 13 |
| no igmp-snooping report-proxy | Disables IGMP snooping report-proxy mode. In this mode, the Switch just snoops on and sends the multicast router/switch all IGMP join messages without changing their source MAC addresses, and forwards multicast traffic to the hosts. | C | 13 |
| igmp-snooping reserved-multicast-frame <drop flooding> | Sets how to treat traffic with a reserved multicast address. Reserved multicast addresses are in the range 224.0.0.0 to 224.0.0.255. | C | 13 |
| igmp-snooping unknown-multicast-frame <drop flooding> | Sets how to treat traffic from unknown multicast groups. | C | 13 |
| show igmp-snooping | Displays global IGMP snooping settings. | E | 3 |
| show igmp-snooping filtering profile | Displays IGMP filtering profile settings. | E | 3 |
| show igmp-snooping group all | Displays all multicast group information. | E | 3 |

Table 80 igmp-snooping Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|---|
| show igmp-snooping group client <[vlan <vlan-list>] [interface port-channel <port-list>] [multicast-group <group-address>]> | Displays client IP information for the specified multicast VLAN(s), port(s) and/or multicast group(s). | E | 3 |
| show igmp-snooping group client all | Displays client IP information for all multicast groups on the Switch. | E | 3 |
| show igmp-snooping group count | Displays the total number of the multicast groups on the Switch. | E | 3 |
| show igmp-snooping group interface port-channel <port-list> | Displays the multicast group(s) to which the specified port(s) belongs. | E | 3 |
| show igmp-snooping group interface port-channel <port-list> count | Displays the number of the multicast group(s) to which the specified port(s) belongs. | E | 3 |
| show igmp-snooping group vlan <vlan-list> | Displays the multicast group(s) for the specified multicast VLAN(s). | E | 3 |
| show igmp-snooping group vlan <vlan-list> count | Displays the number of the multicast group(s) for the specified multicast VLAN(s). | E | 3 |
| show igmp-snooping querier | Displays the IGMP query mode for the ports on the Switch. | E | 3 |
| show igmp-snooping statistics interface port-channel <port-list> | Displays the multicast statistics of the specified port(s). | E | 3 |
| show igmp-snooping statistics system | Displays the multicast statistics of the Switch. | E | 3 |
| show igmp-snooping statistics vlan <vlan-list> | Displays the multicast statistics of the specified multicast VLAN(s). | E | 3 |
| show multicast [vlan] | Displays multicast status, including the port number, VLAN ID and multicast group members on the Switch. Optionally, displays the type of each multicast VLAN. | E | 3 |

Table 81 igmp-snooping vlan Command Summary

| COMMAND | DESCRIPTION | M | P |
|--------------------------------------|---|---|----|
| show igmp-snooping vlan | Displays the VLANs on which IGMP snooping is enabled. | E | 3 |
| igmp-snooping vlan mode <auto fixed> | Specifies how the VLANs on which the Switch snoops IGMP packets are selected. auto: The Switch learns multicast group membership on any VLAN. See the User's Guide for the maximum number of VLANs the switch supports for IGMP snooping. The Switch drops any IGMP control messages on other VLANs after it reaches this maximum number (auto mode). fixed: The Switch only learns multicast group membership on specified VLAN(s). The Switch drops any IGMP control messages for any unspecified VLANs (fixed mode). See the User's Guide for the maximum number of VLANs the switch supports for IGMP snooping. | C | 13 |

Table 81 igmp-snooping vlan Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| igmp-snooping vlan <vlan-id> [name <name>] | Specifies which VLANs to perform IGMP snooping on if the mode is <i>fixed</i> . Optionally, sets a name for the multicast VLAN. <i>name</i> : 1-32 printable characters; spaces are allowed if you put the string in double quotation marks (""). | C | 13 |
| no igmp-snooping vlan <vlan-id> | Removes IGMP snooping configuration on the specified VLAN if the mode is <i>fixed</i> . | C | 13 |

Table 82 interface igmp Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| show interfaces config <port-list> igmp-group-limited | Displays the group limits for IGMP snooping. | E | 3 |
| show interfaces config <port-list> igmp-immediate-leave | Displays the immediate leave settings for IGMP snooping. | E | 3 |
| show interfaces config <port-list> igmp-query-mode | Displays the IGMP query mode for the specified port(s). | E | 3 |
| show interfaces config <port-list> igmp-snooping filtering | Displays the name(s) of the IGMP filtering profiles used for the specified port(s). | E | 3 |
| show interfaces config <port-list> igmp-snooping group-limited | Displays whether the group limit is enabled and the maximum number of the multicast groups the specified port(s) is allowed to join. | E | 3 |
| show interfaces config <port-list> igmp-snooping leave-mode | Displays the IGMP leave mode of the specified port(s). | E | 3 |
| show interfaces config <port-list> igmp-snooping query-mode | Displays the IGMP querier mode of the specified port(s). | E | 3 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |
| igmp-snooping authentication | Enables IGMP snooping authentication on the port(s). When a multicast host (connected to the specified ports) sends a message to join a multicast group, the Switch sends an access request (that contains the host identification information) to an AAA server before forwarding the join message to the multicast router/switch. The Switch learns the multicast group membership when the AAA server returns an access-accept. If the AAA server returns an access-reject, the Switch will not learn the multicast group membership, nor process the packet further. If the multicast group and port has already been learned, the Switch will not do the authentication again. | C | 13 |
| igmp-snooping fast-leave-timeout <200-6348800> | Set the IGMP snooping fast leave timeout (in milliseconds) the Switch uses to update the forwarding table for the port(s). This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host. | C | 13 |
| igmp-snooping filtering profile <name> | Assigns the specified IGMP filtering profile to the port(s). If IGMP filtering is enabled on the Switch, the port(s) can only join the multicast groups in the specified profile. | C | 13 |
| igmp-snooping group-limited | Enables the group limiting feature for IGMP snooping. You must enable IGMP snooping as well. | C | 13 |

Table 82 interface igmp Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| igmp-snooping group-limited action <deny replace> | Sets how the Switch deals with the IGMP reports when the maximum number of the IGMP groups a port can join is reached. <i>deny</i> : The Switch drops any new IGMP join report received on this port until an existing multicast forwarding table entry is aged out. <i>replace</i> : The Switch replaces an existing entry in the multicast forwarding table with the new IGMP report(s) received on this port. | C | 13 |
| igmp-snooping group-limited number <number> | Sets the maximum number of multicast groups allowed. <i>number</i> : 0-255 | C | 13 |
| igmp-snooping leave-mode <normal immediate fast> | Sets the Switch to remove an IGMP snooping membership entry immediately (<i>immediate</i>) or wait for an IGMP report before the normal (<i>normal</i>) or fast (<i>fast</i>) leave timeout when an IGMP leave message is received on this port from a host. | C | 13 |
| igmp-snooping leave-timeout <200-6348800> | Set the IGMP snooping normal leave timeout (in milliseconds) the Switch uses to update the forwarding table for the port(s). This defines how many seconds the Switch waits for an IGMP report before removing an IGMP snooping membership entry when an IGMP leave message is received on this port from a host. | C | 13 |
| igmp-snooping querier-mode <auto fixed edge> | Specifies whether or not and under what conditions the port(s) is (are) IGMP query port(s). The Switch forwards IGMP join or leave packets to an IGMP query port, treating the port as being connected to an IGMP multicast router (or server). You must enable IGMP snooping as well. <i>fixed</i> : The Switch always treats the port(s) as IGMP query port(s). Select this when you connect an IGMP multicast server to the port(s). <i>auto</i> : The Switch uses the port as an IGMP query port if the port receives IGMP query packets. <i>edge</i> : The Switch does not use the port as an IGMP query port. The Switch does not keep any record of an IGMP router being connected to this port. The Switch does not forward IGMP join or leave packets to this port. | C | 13 |
| no igmp-snooping authentication | Disables IGMP snooping authentication on the port(s). The Switch directly forwards the host's join message to the multicast router without sending an access request to the AAA server for authentication. | C | 13 |
| no igmp-snooping filtering profile | Prohibits the port(s) from joining any multicast groups if IGMP filtering is enabled on the Switch. | C | 13 |
| no igmp-snooping group- limited | Disables multicast group limits. | C | 13 |
| igmp-group-limited | Enables the group limiting feature for IGMP snooping. You must enable IGMP snooping as well. | C | 13 |
| igmp-group-limited number <number> | Sets the maximum number of multicast groups allowed. <i>number</i> : 0-255 | C | 13 |
| no igmp-group-limited | Disables multicast group limits. | C | 13 |
| igmp-immediate-leave | Enables the immediate leave function for IGMP snooping. You must enable IGMP snooping as well. | C | 13 |

Table 82 interface igmp Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| no igmp-immediate-leave | Disables the immediate leave function for IGMP snooping. | C | 13 |
| igmp-querier-mode <auto fixed edge> | Specifies whether or not and under what conditions the port(s) is (are) IGMP query port(s). The Switch forwards IGMP join or leave packets to an IGMP query port, treating the port as being connected to an IGMP multicast router (or server). You must enable IGMP snooping as well. <i>fixed</i> : The Switch always treats the port(s) as IGMP query port(s). Select this when you connect an IGMP multicast server to the port(s). <i>auto</i> : The Switch uses the port as an IGMP query port if the port receives IGMP query packets. <i>edge</i> : The Switch does not use the port as an IGMP query port. The Switch does not keep any record of an IGMP router being connected to this port. The Switch does not forward IGMP join or leave packets to this port. | C | 13 |

31.2 Command Examples

This example enables IGMP snooping on the Switch, sets the `host-timeout` value to 30 seconds, and sets the Switch to drop packets from unknown multicast groups.

```
sysname(config)# igmp-snooping
sysname(config)# igmp-snooping host-timeout 30
sysname(config)# igmp-snooping unknown-multicast-frame drop
```

This example limits the number of multicast groups on port 1 to 5.

```
sysname# configure
sysname(config)# igmp-snooping
sysname(config)# interface port-channel 1
sysname(config-interface)# igmp-snooping group-limited
sysname(config-interface)# igmp-snooping group-limited number 5
sysname(config-interface)# exit
sysname(config)# exit
sysname# show interfaces config 1 igmp-snooping group-limited
Port          Enable           Max Multicast Group
-----
1              YES              5
```

This example shows the current multicast groups on the Switch.

```
sysname# show multicast
Multicast Status

Index   VID   Port   Multicast Group   Timeout
-----
-----
```


The following table describes the labels in this screen.

Table 83 show multicast

| LABEL | DESCRIPTION |
|-----------------|---|
| Index | This field displays an entry number for the VLAN. |
| VID | This field displays the multicast VLAN ID. |
| Port | This field displays the port number that belongs to the multicast group. |
| Multicast Group | This field displays the IP multicast group addresses. |
| Timeout | This field displays how long the port will belong to the multicast group. |

This example shows the current multicast VLAN on the Switch.

```

sysname# show multicast vlan
Multicast Vlan Status

  Index   VID   Type
  -----
      1    3   MVR

```

This example restricts ports 1-4 to multicast IP addresses 224.255.255.0 through 225.255.255.255.

```

sysname# configure
sysname(config)# igmp-snooping filtering
sysname(config)# igmp-snooping filtering profile example1 start-address
--> 224.255.255.0 end-address 225.255.255.255
sysname(config)# interface port-channel 1-4
sysname(config-interface)# igmp-snooping filtering profile example1
sysname(config-interface)# exit
sysname(config)# exit

```

IGMP Filtering Commands

Use these commands to configure IGMP filters and IGMP filtering on the Switch.

32.1 Command Summary

The following section lists the commands for this feature.

Table 84 igmp-filtering Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show igmp-filtering profile</code> | Displays IGMP filtering profile settings. | E | 3 |
| <code>igmp-filtering</code> | Enables IGMP filtering on the Switch. Ports can only join multicast groups specified in their IGMP filtering profile. | C | 13 |
| <code>no igmp-filtering</code> | Disables IGMP filtering on the Switch. | C | 13 |
| <code>igmp-filtering profile <name> start-address <ip> end-address <ip></code> | Sets the range of multicast address(es) in a profile. <i>name</i> : 1-32 alphanumeric characters | C | 13 |
| <code>no igmp-filtering profile <name></code> | Removes the specified IGMP filtering profile. You cannot delete an IGMP filtering profile that is assigned to any ports. | C | 13 |
| <code>no igmp-filtering profile <name> start-address <ip> end-address <ip></code> | Clears the specified rule of the specified IGMP filtering profile. | C | 13 |
| <code>show interfaces config <port- list> igmp-filtering</code> | Displays IGMP filtering settings. | E | 3 |
| <code>interface port-channel <port- list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>igmp-filtering profile <name></code> | Assigns the specified IGMP filtering profile to the port(s). If IGMP filtering is enabled on the Switch, the port(s) can only join the multicast groups in the specified profile. | C | 13 |
| <code>no igmp-filtering profile</code> | Prohibits the port(s) from joining any multicast groups if IGMP filtering is enabled on the Switch. | C | 13 |

32.2 Command Examples

This example restricts ports 1-4 to multicast IP addresses 224.255.255.0 through 225.255.255.255.

```
sysname# configure
sysname(config)# igmp-filtering
sysname(config)# igmp-filtering profile example1 start-address
--> 224.255.255.0 end-address 225.255.255.255
sysname(config)# interface port-channel 1-4
sysname(config-interface)# igmp-filtering profile example1
sysname(config-interface)# exit
sysname(config)# exit
```

Interface Commands

Use these commands to configure basic port settings.

33.1 Command Summary

The following section lists the commands for this feature.

Table 85 interface Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>clear interface <port-num></code> | Clears all statistics for the specified port. | E | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>bpdu-control</code> <code><peer tunnel discard network></code> | Sets how Bridge Protocol Data Units (BPDUs) are used in STP port states. <code>peer</code> : process any BPDU (Bridge Protocol Data Units) received on this port. <code>tunnel</code> : forward BPDUs received on this port. <code>discard</code> : drop any BPDU received on this port. <code>network</code> : process a BPDU with no VLAN tag and forward a tagged BPDU. | C | 13 |
| <code>cx4-length <0.5 1 3 5 10 15></code> | Sets the number of meters for the length of the 10GBASE-CX4 cable you use to connect between the Switch and another switch for stacking. | C | 13 |
| <code>flow-control</code> | Enables interface flow control. Flow control regulates transmissions to match the bandwidth of the receiving port. | C | 13 |
| <code>frame-type</code> <code><all tagged untagged></code> | Choose to accept both tagged and untagged incoming frames (<code>all</code>), just tagged incoming frames (<code>tagged</code>) or just untagged incoming frames on a port (<code>untagged</code>). Note: Not all switch models support accepting untagged frames on a port. | C | 13 |
| <code>inactive</code> | Disables the specified port(s) on the Switch. | C | 13 |
| <code>intrusion-lock</code> | Enables intrusion lock on the port(s) and a port cannot be connected again after you disconnected the cable. Note: Intrusion lock is not available on a 10 Gigabit Ethernet port. | C | 13 |

Table 85 interface Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>media-type 10g <SFP+ DAC10G></code> | Sets the media type of the SFP+ module that is attached to the 10 Gigabit interface. On the Switch that has a 10 Gigabit interface, such as the SFP+ slot, you can insert either an SFP+ transceiver or an SFP+ Direct Attach Copper (DAC). An SFP+ Direct Attach Copper (DAC) is an SFP+ housing that has no optical module but uses a fixed-length passive copper cable assembly, which reduces cost and power significantly. | C | 13 |
| <code>name <port-name-string></code> | Sets a name for the port(s). <i>port-name-string</i> : up to 64 English keyboard characters | C | 13 |
| <code>no flow-control</code> | Disables flow control on the port(s). | C | 13 |
| <code>no inactive</code> | Enables the port(s) on the Switch. | C | 13 |
| <code>no intrusion-lock</code> | Disables intrusion-lock on a port so that a port can be connected again after you disconnected the cable. | C | 13 |
| <code>pvid <1-4094></code> | The default PVID is VLAN 1 for all ports. Sets a PVID in the range 1 to 4094 for the specified interface. | C | 13 |
| <code>qos priority <0-7></code> | Sets the quality of service priority for an interface. | C | 13 |
| <code>speed-duplex <auto 10-half 10-full 100-half 100-full 1000-full 1000-auto 10000-full 40000-full></code> | Sets the duplex mode (half or full) and speed (10, 100, 1000, 10000 or 40000 Mbps) of the connection on the interface. Select <code>auto</code> (auto-negotiation) to let the specified port(s) negotiate with a peer to obtain the connection speed and duplex mode. | C | 13 |
| <code>no interface <port-num></code> | Resets the port counters for the specified port(s). | E | 13 |
| <code>show interfaces <port-list></code> | Displays the current interface status for the specified port(s). | E | 3 |
| <code>show interfaces config <port-list></code> | Displays current interface configuration for the specified port(s). | E | 3 |

33.2 Command Examples

This example looks at the current status of port 1.

```

sysname# show interfaces 1
  Port Info      Port NO.      :1
                Link          :100M/F
                Status       :FORWARDING
                LACP         :Disabled
                TxPkts       :7214
                RxPkts       :395454
                Errors       :0
                Tx KBs/s     :0.0
                Rx KBs/s     :0.0
                Up Time      :127:26:26
TX Packet       Unicast       :7214
                Multicast    :0
                Broadcast    :163
                Pause        :0
                Tagged       :0
RX Packet       Unicast       :395454
                Multicast    :186495
                Broadcast    :200177
                Pause        :0
                Control      :0
TX Collison     Single         :0
                Multiple     :0
                Excessive    :0
                Late         :0
Error Packet    RX CRC        :0
                Runt         :0
Distribution    64             :285034
                65 to 127   :31914
                128 to 255  :22277
                256 to 511  :50546
                512 to 1023 :1420
                1024 to 1518 :4268
                Giant       :0

```

The following table describes the labels in this screen.

Table 86 show interfaces

| LABEL | DESCRIPTION |
|-----------|---|
| Port Info | |
| Port NO. | This field displays the port number you are viewing. |
| Link | This field displays the speed (either 10M for 10 Mbps, 100M for 100 Mbps, 1000M for 1Gbps, 1000M for 1Gbps, 10000M for 10Gbps or 40000M for 40Gbps) and the duplex (F for full duplex or H for half duplex). It also shows the cable type (Copper or Fiber). This field displays Down if the port is not connected to any device. |
| Status | If STP (Spanning Tree Protocol) is enabled, this field displays the STP state of the port. If STP is disabled, this field displays FORWARDING if the link is up, otherwise, it displays STOP. |
| LACP | This field shows if LACP is enabled on this port or not. |

Table 86 show interfaces (continued)

| LABEL | DESCRIPTION |
|--|--|
| TxPkts | This field shows the number of transmitted frames on this port |
| RxPkts | This field shows the number of received frames on this port |
| Errors | This field shows the number of received errors on this port. |
| Tx KBs/s | This field shows the number kilobytes per second transmitted on this port. |
| Rx KBs/s | This field shows the number of kilobytes per second received on this port. |
| Up Time | This field shows the total amount of time the connection has been up. |
| Tx Packet The following fields display detailed information about packets transmitted. | |
| Unicast | This field shows the number of good unicast packets transmitted. |
| Multicast | This field shows the number of good multicast packets transmitted. |
| Broadcast | This field shows the number of good broadcast packets transmitted. |
| Pause | This field shows the number of 802.3x Pause packets transmitted. |
| Tagged | This field shows the number of packets with VLAN tags transmitted. |
| Rx Packet The following fields display detailed information about packets received. | |
| Unicast | This field shows the number of good unicast packets received. |
| Multicast | This field shows the number of good multicast packets received. |
| Broadcast | This field shows the number of good broadcast packets received. |
| Pause | This field shows the number of 802.3x Pause packets received. |
| Control | This field shows the number of control packets received (including those with CRC error) but it does not include the 802.3x Pause packets. |
| TX Collision The following fields display information on collisions while transmitting. | |
| Single | This is a count of successfully transmitted packets for which transmission is inhibited by exactly one collision. |
| Multiple | This is a count of successfully transmitted packets for which transmission was inhibited by more than one collision. |
| Excessive | This is a count of packets for which transmission failed due to excessive collisions. Excessive collision is defined as the number of maximum collisions before the retransmission count is reset. |
| Late | This is the number of times a late collision is detected, that is, after 512 bits of the packets have already been transmitted. |
| Error Packet The following fields display detailed information about packets received that were in error. | |
| RX CRC | This field shows the number of packets received with CRC (Cyclic Redundant Check) error(s). |
| Runt | This field shows the number of packets received that were too short (shorter than 64 octets), including the ones with CRC errors. |
| Distribution | |
| 64 | This field shows the number of packets (including bad packets) received that were 64 octets in length. |
| 65-127 | This field shows the number of packets (including bad packets) received that were between 65 and 127 octets in length. |

Table 86 show interfaces (continued)

| LABEL | DESCRIPTION |
|-----------|--|
| 128-255 | This field shows the number of packets (including bad packets) received that were between 128 and 255 octets in length. |
| 256-511 | This field shows the number of packets (including bad packets) received that were between 256 and 511 octets in length. |
| 512-1023 | This field shows the number of packets (including bad packets) received that were between 512 and 1023 octets in length. |
| 1024-1518 | This field shows the number of packets (including bad packets) received that were between 1024 and 1518 octets in length. |
| Giant | This field shows the number of packets (including bad packets) received that were between 1519 octets and the maximum frame size. The maximum frame size varies depending on your switch model. See Product Specification chapter in your User's Guide. |

This example configures ports 1, 3, 4, and 5 in the following ways:

- 1 Sets the IEEE 802.1p quality of service priority to four (4).
- 2 Sets the name "Test".
- 3 Sets the speed to 100 Mbps in half duplex mode.

```

sysname(config)# interface port-channel 1,3-5
sysname(config-interface)# qos priority 4
sysname(config-interface)# name Test
sysname(config-interface)# speed-duplex 100-half

```

This example configures ports 1-5 in the following ways:

- 1 Sets the default port VID to 200.
- 2 Sets these ports to accept only tagged frames.

```

sysname (config)# interface port-channel 1-5
sysname (config-interface)# pvid 200
sysname (config-interface)# frame-type tagged

```


Interface Route-domain Mode

In order to configure layer 3 routing features on the Switch, you must enter the interface routing domain mode in the CLI.

34.1 Command Summary

The following section lists the commands for this feature.

Table 87 Interface Route Domain Command Summary:

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>interface route-domain <ip-address>/<mask-bits></code> | Enters the configuration mode for this routing domain. The mask-bits are defined as the number of bits in the subnet mask. Enter the subnet mask number preceded with a "/". To find the bit number, convert the subnet mask to binary and add all of the 1's together. Take "255.255.255.0" for example. 255 converts to eight 1's in binary. There are three 255's, so add three eights together and you get the bit number (24). | C | 13 |
| <code>exit</code> | Exits from the interface routing-domain configuration mode. | C | 13 |

34.2 Command Examples

Use this command to enable/create the specified routing domain for configuration.

- Enter the configuration mode.
- Enable default routing domain (the 192.168.1.1 subnet) for configuration.
- Begin configuring for this domain.

```
sysname# config
sysname(config)# interface route-domain 192.168.1.1/24
sysname(config-if)#
```

IP Commands

Use these commands to configure the management port IP address, default domain name server and to look at IP domains.



See [Chapter 78 on page 289](#) for static route commands.



See [Chapter 36 on page 135](#) for IP source binding commands.

35.1 Command Summary

The following section lists the commands for this feature.

Table 88 ip Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show ip</code> | Displays current IPv4 interfaces. | E | 0 |
| <code>show ipv6</code> | Displays current IPv6 interfaces. | E | 0 |
| <code>ip address <ip> <mask></code> | Sets the IP address of the MGMT port (for out-of-band management) on the Switch. | E | 0 |
| <code>ip address default-gateway <ip></code> | Sets the default gateway for the out-of-band management interface on the Switch. | C | 13 |
| <code>ip name-server <ip ipv6></code> | Sets the IPv4 and/or IPv6 address(es) of the domain name server(s). | C | 13 |
| <code>no ip name-server <all ip ipv6></code> | Removes all or the specified DNS server. | C | 13 |
| <code>show ip iptable all [IP VID PORT]</code> | Displays the IP address table. You can sort the table based on the IP address, VLAN ID or the port number. | E | 3 |
| <code>show ip iptable count</code> | Displays the number of IP interfaces configured on the Switch. | E | 3 |
| <code>show ip iptable static</code> | Displays the static IP address table. | E | 3 |
| <code>show ip name-server</code> | Displays the DNS server address(es) on the Switch. | E | 3 |

Table 89 tcp and udp Command Summary

| COMMAND | DESCRIPTION | M | P |
|-----------------------|---|---|----|
| show ip tcp | Displays IP TCP information. | E | 3 |
| show ip udp | Displays IP UDP information. | E | 3 |
| kick tcp <session id> | Disconnects the specified TCP session. <i>session id</i> : Display the session id by running the show ip tcp command. See Section 35.2 on page 131 for an example. | E | 13 |

35.2 Command Examples

This example configures two DNS server addresses and displays the settings.

```

sysname# configure
sysname(config)# ip name-server 10.1.2.3 2001::123
sysname# show ip name-server
  Name Server Table:
  Server Address  Source
  -----
           10.1.2.3  Static
           2001::123  Static
sysname#

```

This example shows the TCP statistics and listener ports. See RFC 1213 for more information.

```

sysname# show ip tcp
( 1)tcpRtoAlgorithm          4      ( 2)tcpRtoMin                0
( 3)tcpRtoMax                4294967295  ( 4)tcpMaxConn                4294967295
( 5)tcpActiveOpens           2      ( 6)tcpPassiveOpens           188
( 7)tcpAttemptFails          3      ( 8)tcpEstabResets            25
( 9)tcpCurrEstab              1      (10)tcpInSegs                 4025
(11)tcpOutSegs                5453   (12)tcpRetransSegs            64
(14)tcpInErrs                 0      (15)tcpOutRsts                0
    &TCB Rcv-Q Snd-Q Rcv-Wnd Snd-Wnd Local socket      Remote socket
    State
80d60868      0    620    128    63907 172.16.37.206:23    172.16.5.15:1510
    Estab
80d535a0      0     0     128     1  0.0.0.0:23         0.0.0.0:0
    Listen (S)
80d536bc      0     0    16384     1  0.0.0.0:80         0.0.0.0:0
    Listen (S)
80d5f6a8      0     0    22400     1  0.0.0.0:21         0.0.0.0:0
    Listen
80d5440c      0     0     128     1  0.0.0.0:22         0.0.0.0:0
    Listen
80d541d4      0     0    22400     1  0.0.0.0:443        0.0.0.0:0
    Listen (S)

```

The following table describes the labels in this screen.

Table 90 show ip tcp

| LABEL | DESCRIPTION |
|-----------------|---|
| tcpRtoAlgorithm | This field displays the algorithm used to determine the timeout value that is used for retransmitting unacknowledged octets. |
| tcpRtoMin | This field displays the minimum timeout (in milliseconds) permitted by a TCP implementation for the retransmission timeout. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission timeout. In particular, when the timeout algorithm is rsre(3), an object of this type has the semantics of the LBOUND quantity described in RFC 793. |
| tcpRtoMax | This field displays the maximum timeout (in milliseconds) permitted by a TCP implementation for the retransmission timeout. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission timeout. In particular, when the timeout algorithm is rsre(3), an object of this type has the semantics of the UBOUND quantity described in RFC 793. |
| tcpMaxConn | This field displays the maximum number of TCP connections the Switch can support. If the maximum number is dynamic, this field displays -1. |
| tcpActiveOpens | This field displays the number of times TCP connections have made a direct transition to the SYN-SENT state from the CLOSED state. |
| tcpPassiveOpens | This field displays the number of times TCP connections have made a direct transition to the SYN-RCVD state from the LISTEN state. |
| tcpAttemptFails | This field displays the number of times TCP connections have made a direct transition to the CLOSED state from either the SYN-SENT state or the SYN-RCVD state, plus the number of times TCP connections have made a direct transition to the LISTEN state from the SYN-RCVD state. |
| tcpEstabResets | This field displays the number of times TCP connections have made a direct transition to the CLOSED state from either the ESTABLISHED state or the CLOSE-WAIT state. |
| tcpCurrEstab | This field displays the number of TCP connections for which the current state is either ESTABLISHED or CLOSE-WAIT. |
| tcpInSegs | This field displays the total number of segments received, including those received in error. This count includes segments received on currently established connections. |
| tcpOutSegs | This field displays the total number of segments sent, including those on current connections but excluding those containing only retransmitted octets. |
| tcpRetransSegs | This field displays the total number of TCP segments transmitted containing one or more previously transmitted octets. |
| tcpInErrs | This field displays the total number of segments received with error (for example, bad TCP checksums). |
| tcpOutRsts | This field displays the number of TCP segments sent containing the RST flag. |
| | This section displays the current TCP listeners. |
| &TCB | This field displays the session ID. |
| Rcv-Q | This field displays the items on the receive queue in this connection. |
| Snd-Q | This field displays the sequence number of the first unacknowledged segment on the send queue in this connection. |
| Rcv-Wnd | This field displays the receiving window size in this connection. It determines the amount of received data that can be buffered. |

Table 90 show ip tcp (continued)

| LABEL | DESCRIPTION |
|---------------|--|
| Snd-Wnd | This field displays the sending window size in this connection. It is offered by the remote device. |
| Local socket | This field displays the local IP address and port number in this TCP connection. In the case of a connection in the LISTEN state that is willing to accept connections for any IP interface associated with the node, the value is 0.0.0.0. |
| Remote socket | This field displays the remote IP address and port number in this TCP connection. |
| State | <p>This field displays the state of this TCP connection.</p> <p>The only value which may be set by a management station is deleteTCB(12). Accordingly, it is appropriate for an agent to return a 'badValue' response if a management station attempts to set this object to any other value.</p> <p>If a management station sets this object to the value deleteTCB(12), then this has the effect of deleting the TCB (as defined in RFC 793) of the corresponding connection on the managed node, resulting in immediate termination of the connection.</p> <p>As an implementation-specific option, a RST segment may be sent from the managed node to the other TCP endpoint (note however that RST segments are not sent reliably).</p> |

This example shows the UDP statistics and listener ports. See RFC 1213 for more information.

```

sysname# show ip udp
( 1)udpInDatagrams          10198      ( 2)udpNoPorts              81558
( 3)udpInErrors              0          ( 4)udpOutDatagrams         13
  &UCB Rcv-Q Local socket
80bfdac0      0 0.0.0.0:53
80bfd9ac      0 0.0.0.0:520
80c78888      0 0.0.0.0:161
80c79184      0 0.0.0.0:162
80c3188c      0 0.0.0.0:1027
80c31830      0 0.0.0.0:1026
80bfdb78      0 0.0.0.0:1025
80bfdb1c      0 0.0.0.0:1024
80bfda64      0 0.0.0.0:69
80bfda08      0 0.0.0.0:263

```

The following table describes the labels in this screen.

Table 91 show ip udp

| LABEL | DESCRIPTION |
|-----------------|---|
| udpInDatagrams | This field displays the total number of UDP datagrams delivered to UDP users. |
| udpNoPorts | This field displays the total number of received UDP datagrams for which there was no application at the destination port. |
| udpInErrors | This field displays the number of received UDP datagrams that could not be delivered for reasons other than the lack of an application at the destination port. |
| udpOutDatagrams | This field displays the total number of UDP datagrams sent by the Switch. |
| &UCB | This field displays the process ID. |

Table 91 show ip udp (continued)

| LABEL | DESCRIPTION |
|--------------|--|
| Rcv-Q | This field displays the queue number of pending datagrams in this connection. |
| Local socket | This field displays the local IP address and port number for this UDP listener. In the case of a UDP listener that is willing to accept datagrams for any IP interface associated with the node, the value is 0.0.0.0. |

IP Source Binding Commands

Use these commands to manage the bindings table for IP source guard.

36.1 Command Summary

The following section lists the commands for this feature.

Table 92 ip source binding Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show ip source binding [<mac-addr>] [...]</code> | Displays the bindings configured on the Switch, optionally based on the specified parameters. | E | 3 |
| <code>show ip source binding help</code> | Provides more information about the specified command. | E | 3 |
| <code>ip source binding arp-freeze</code> | Create static bindings from any previously learned ARP entries in the Switch's ARP table and add them in the IP source guard static binding table. | C | 13 |
| <code>ip source binding arp-freeze interface port-channel <port-list></code> | Create static bindings from previously learned ARP entries containing the specified port number and add them in the IP source guard static binding table. | C | 13 |
| <code>ip source binding arp-freeze vlan <vlan-list></code> | Create static bindings from previously learned ARP entries containing the specified VLAN ID and add them in the IP source guard static binding table. | C | 13 |
| <code>ip source binding <mac-addr> vlan <vlan-id> <ip> [interface port-channel <interface-id>]</code> | Creates a static binding for ARP inspection. | C | 13 |
| <code>no ip source binding <mac-addr> vlan <vlan-id></code> | Removes the specified static binding. | C | 13 |

36.2 Command Examples

This example shows the current binding table.

```

sysname# show ip source binding
      MacAddress      IpAddress      Lease      Type  VLAN  Port
-----
Total number of bindings: 0

```

The following table describes the labels in this screen.

Table 93 show ip source binding

| LABEL | DESCRIPTION |
|------------|---|
| MacAddress | This field displays the source MAC address in the binding. |
| IpAddress | This field displays the IP address assigned to the MAC address in the binding. |
| Lease | This field displays how many days, hours, minutes, and seconds the binding is valid; for example, 2d3h4m5s means the binding is still valid for 2 days, 3 hours, 4 minutes, and 5 seconds. This field displays infinity if the binding is always valid (for example, a static binding). |
| Type | This field displays how the switch learned the binding. static: This binding was learned from information provided manually by an administrator. |
| VLAN | This field displays the source VLAN ID in the binding. |
| Port | This field displays the port number in the binding. If this field is blank, the binding applies to all ports. |

IPv6 Commands

37.1 IPv6 Overview

IPv6 (Internet Protocol version 6), is designed to enhance IP address size and features. The increase in IPv6 address size to 128 bits (from the 32-bit IPv4 address) allows up to 3.4×10^{38} IP addresses. At the time of writing, the Switch supports the following features.

- Static address assignment (see [Section 37.1.1 on page 137](#)) and stateless autoconfiguration (see [Stateless Autoconfiguration on page 140](#))
- Neighbor Discovery Protocol (see [Neighbor Discovery Protocol \(NDP\) on page 142](#))
- Remote Management using SNMP, Telnet, HTTP and FTP services (see [Chapter 67 on page 251](#))
- ICMPv6 (see [ICMPv6 on page 141](#))
- IPv4/IPv6 dual stack; the Switch can run IPv4 and IPv6 at the same time.
- DHCPv6 client and relay (see [DHCPv6 on page 140](#))
- Multicast Listener Discovery (MLD) snooping and proxy (see [Multicast Listener Discovery on page 142](#))

For more information on IPv6 addresses, refer to RFC 2460 and RFC 4291.

37.1.1 IPv6 Addressing

The 128-bit IPv6 address is written as eight 16-bit hexadecimal blocks separated by colons (:). This is an example IPv6 address `2001:0db8:1a2b:0015:0000:0000:1a2f:0000`.

IPv6 addresses can be abbreviated in two ways:

- Leading zeros in a block can be omitted. So `2001:0db8:1a2b:0015:0000:0000:1a2f:0000` can be written as `2001:db8:1a2b:15:0:0:1a2f:0`.
- Any number of consecutive blocks of zeros can be replaced by a double colon. A double colon can only appear once in an IPv6 address. So `2001:0db8:0000:0000:1a2f:0000:0000:0015` can be written as `2001:0db8::1a2f:0000:0000:0015` or `2001:0db8:0000:0000:1a2f::0015`.

37.1.2 IPv6 Terms

IPv6 Prefix and Prefix Length

Similar to an IPv4 subnet mask, IPv6 uses an address prefix to represent the network address. An IPv6 prefix length specifies how many most significant bits (start from the left) in the address compose the network address. The prefix length is written as “/x” where x is a number. For example,

```
2001:db8:1a2b:15::1a2f:0/32
```

means that the first 32 bits (2001:db8) is the subnet prefix.

Interface ID

In IPv6, an interface ID is a 64-bit identifier. It identifies a physical interface (for example, an Ethernet port) or a virtual interface (for example, the management IP address for a VLAN). One interface should have a unique interface ID.

Link-local Address

A link-local address uniquely identifies a device on the local network (the LAN). It is similar to a “private IP address” in IPv4. You can have the same link-local address on multiple interfaces on a device. A link-local unicast address has a predefined prefix of fe80::/10. The link-local unicast address format is as follows.

Table 94 Link-local Unicast Address Format

| | | |
|--------------|---------|--------------|
| 1111 1110 10 | 0 | Interface ID |
| 10 bits | 54 bits | 64 bits |

Global Address

A global address uniquely identifies a device on the Internet. It is similar to a “public IP address” in IPv4. The global address format as follows.

Table 95 Global Address Format

| | | | |
|--------|-----------|-----------|--------------|
| 001 | Global ID | Subnet ID | Interface ID |
| 3 bits | 45 bits | 16 bits | 64 bits |

The global ID is the network identifier or prefix of the address and is used for routing. This may be assigned by service providers.

The subnet ID is a number that identifies the subnet of a site.

Multicast Address

In IPv6, multicast addresses provide the same functionality as IPv4 broadcast addresses. Broadcasting is not supported in IPv6. A multicast address allows a host to send packets to all hosts in a multicast group.

Multicast scope allows you to determine the size of the multicast group. A multicast address has a predefined prefix of ff00::/8. The following table describes some of the predefined multicast addresses.

Table 96 Predefined Multicast Address

| MULTICAST ADDRESS | DESCRIPTION |
|--------------------|--|
| FF01:0:0:0:0:0:0:1 | All hosts on a local node. |
| FF01:0:0:0:0:0:0:2 | All routers on a local node. |
| FF02:0:0:0:0:0:0:1 | All hosts on a local connected link. |
| FF02:0:0:0:0:0:0:2 | All routers on a local connected link. |
| FF05:0:0:0:0:0:0:2 | All routers on a local site. |
| FF05:0:0:0:0:0:1:3 | All DHCP servers on a local site. |

The following table describes the multicast addresses which are reserved and can not be assigned to a multicast group.

Table 97 Reserved Multicast Address

| MULTICAST ADDRESS |
|--------------------|
| FF00:0:0:0:0:0:0:0 |
| FF01:0:0:0:0:0:0:0 |
| FF02:0:0:0:0:0:0:0 |
| FF03:0:0:0:0:0:0:0 |
| FF04:0:0:0:0:0:0:0 |
| FF05:0:0:0:0:0:0:0 |
| FF06:0:0:0:0:0:0:0 |
| FF07:0:0:0:0:0:0:0 |
| FF08:0:0:0:0:0:0:0 |
| FF09:0:0:0:0:0:0:0 |
| FF0A:0:0:0:0:0:0:0 |
| FF0B:0:0:0:0:0:0:0 |
| FF0C:0:0:0:0:0:0:0 |
| FF0D:0:0:0:0:0:0:0 |
| FF0E:0:0:0:0:0:0:0 |
| FF0F:0:0:0:0:0:0:0 |

Loopback

A loopback address (0:0:0:0:0:0:0:1 or ::1) allows a host to send packets to itself. It is similar to “127.0.0.1” in IPv4.

Unspecified

An unspecified address (0:0:0:0:0:0 or ::) is used as the source address when a device does not have its own address. It is similar to “0.0.0.0” in IPv4.

EUI-64

The EUI-64 (Extended Unique Identifier) defined by the IEEE (Institute of Electrical and Electronics Engineers) is an interface ID format designed to adapt with IPv6. It is derived from the 48-bit (6-byte) Ethernet MAC address as shown next. EUI-64 inserts the hex digits fffe between the third and fourth bytes of the MAC address and complements the seventh bit of the first byte of the MAC address. See the following example.

| | |
|---------------|---------------------------------------|
| MAC | 00 : 13 : 49 : 12 : 34 : 56 |
| EUI-64 | 02 : 13 : 49 : FF : FE : 12 : 34 : 56 |

Stateless Autoconfiguration

With stateless autoconfiguration in IPv6, addresses can be uniquely and automatically generated. Unlike DHCPv6 (Dynamic Host Configuration Protocol version six) which is used in IPv6 stateful autoconfiguration, the owner and status of addresses don’t need to be maintained by a DHCP server. Every IPv6 device is able to generate its own and unique IP address automatically when IPv6 is initiated on its interface. It combines the prefix and the interface ID (generated from its own Ethernet MAC address, see [Interface ID](#) and [EUI-64](#)) to form a complete IPv6 address.

When IPv6 is enabled on a device, its interface automatically generates a link-local address (beginning with fe80).

When the interface is connected to a network with a router and the `ipv6 address autoconfig` command is issued on the Switch, it generates ¹another address which combines its interface ID and global and subnet information advertised from the router. This is a routable global IP address.

DHCPv6

The Dynamic Host Configuration Protocol for IPv6 (DHCPv6, RFC 3315) is a server-client protocol that allows a DHCP server to assign and pass IPv6 network addresses, prefixes and other configuration information to DHCP clients. DHCPv6 servers and clients exchange DHCP messages using UDP.

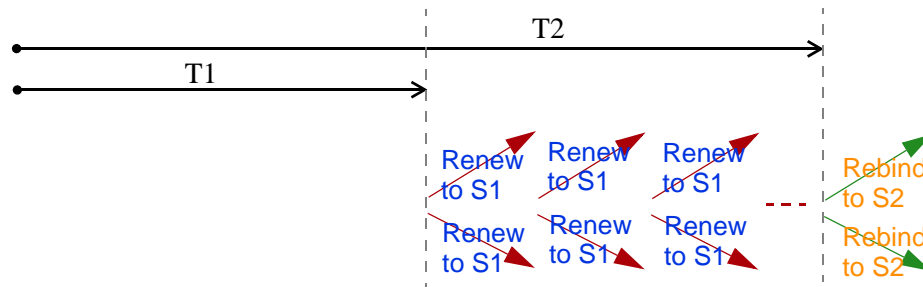
Each DHCP client and server has a unique DHCP Unique Identifier (DUID), which is used for identification when they are exchanging DHCPv6 messages. The DUID is generated from the MAC address, time, vendor assigned ID and/or the vendor's private enterprise number registered with the IANA. It should not change over time even after you reboot the device.

1. In IPv6, all network interfaces can be associated with several addresses.

Identity Association

An Identity Association (IA) is a collection of addresses assigned to a DHCP client, through which the server and client can manage a set of related IP addresses. Each IA must be associated with exactly one interface. The DHCP client uses the IA assigned to an interface to obtain configuration from a DHCP server for that interface. Each IA consists of a unique IAID and associated IP information.

The IA type is the type of address in the IA. Each IA holds one type of address. IA_NA means an identity association for non-temporary addresses and IA_TA is an identity association for temporary addresses. An IA_NA option contains the T1 and T2 fields, but an IA_TA option does not. The DHCPv6 server uses T1 and T2 to control the time at which the client contacts with the server to extend the lifetimes on any addresses in the IA_NA before the lifetimes expire. After T1, the client sends the server (**S1**) (from which the addresses in the IA_NA were obtained) a Renew message. If the time T2 is reached and the server does not respond, the client sends a Rebind message to any available server (**S2**). For an IA_TA, the client may send a Renew or Rebind message at the client's discretion.



DHCP Relay Agent

A DHCP relay agent is on the same network as the DHCP clients and helps forward messages between the DHCP server and clients. When a client cannot use its link-local address and a well-known multicast address to locate a DHCP server on its network, it then needs a DHCP relay agent to send a message to a DHCP server that is not attached to the same network.

The DHCP relay agent can add the remote identification (remote-ID) option and the interface-ID option to the Relay-Forward DHCPv6 messages. The remote-ID option carries a user-defined string, such as the system name. The interface-ID option provides slot number, port information and the VLAN ID to the DHCPv6 server. The remote-ID option (if any) is stripped from the Relay-Reply messages before the relay agent sends the packets to the clients. The DHCP server copies the interface-ID option from the Relay-Forward message into the Relay-Reply message and sends it to the relay agent. The interface-ID should not change even after the relay agent restarts.

ICMPv6

Internet Control Message Protocol for IPv6 (ICMPv6 or ICMP for IPv6) is defined in RFC 4443. ICMPv6 has a preceding Next Header value of 58, which is different from the value used to identify ICMP for IPv4. ICMPv6 is an integral part of IPv6. IPv6 nodes use ICMPv6 to report errors encountered in packet processing and perform other diagnostic functions, such as "ping".

Neighbor Discovery Protocol (NDP)

The Neighbor Discovery Protocol (NDP) is a protocol used to discover other IPv6 devices and track neighbor's reachability in a network.

An IPv6 device uses the following ICMPv6 messages types:

- Neighbor solicitation: A request from a host to determine a neighbor's link-layer address (MAC address) and detect if the neighbor is still reachable. A neighbor being "reachable" means it responds to a neighbor solicitation message (from the host) with a neighbor advertisement message.
- Neighbor advertisement: A response from a node to announce its link-layer address.
- Router solicitation: A request from a host to locate a router that can act as the default router and forward packets.
- Router advertisement: A response to a router solicitation or a periodical multicast advertisement from a router to advertise its presence and other parameters.

IPv6 Cache

An IPv6 host is required to have a neighbor cache, destination cache, prefix list and default router list. The Switch maintains and updates its IPv6 caches constantly using the information from response messages. In IPv6, the Switch configures a link-local address automatically, and then sends a neighbor solicitation message to check if the address is unique. If there is an address to be resolved or verified, the Switch also sends out a neighbor solicitation message. When the Switch receives a neighbor advertisement in response, it stores the neighbor's link-layer address in the neighbor cache. When the Switch uses a router solicitation message to query for a router and receives a router advertisement message, it adds the router's information to the neighbor cache, prefix list and destination cache. The Switch creates an entry in the default router list cache if the router can be used as a default router.

When the Switch needs to send a packet, it first consults the destination cache to determine the next hop. If there is no matching entry in the destination cache, the Switch uses the prefix list to determine whether the destination address is on-link and can be reached directly without passing through a router. If the address is onlink, the address is considered as the next hop. Otherwise, the Switch determines the next-hop from the default router list or routing table. Once the next hop IP address is known, the Switch looks into the neighbor cache to get the link-layer address and sends the packet when the neighbor is reachable. If the Switch cannot find an entry in the neighbor cache or the state for the neighbor is not reachable, it starts the address resolution process. This helps reduce the number of IPv6 solicitation and advertisement messages.

Multicast Listener Discovery

The Multicast Listener Discovery (MLD) protocol (defined in RFC 2710) is derived from IPv4's Internet Group Management Protocol version 2 (IGMPv2). MLD uses ICMPv6 message types, rather than IGMP message types. MLDv1 is equivalent to IGMPv2 and MLDv2 is equivalent to IGMPv3.

MLD allows an IPv6 switch or router to discover the presence of MLD listeners who wish to receive multicast packets and the IP addresses of multicast groups the hosts want to join on its network.

MLD snooping and MLD proxy are analogous to IGMP snooping and IGMP proxy in IPv4.

MLD filtering controls which multicast groups a port can join.

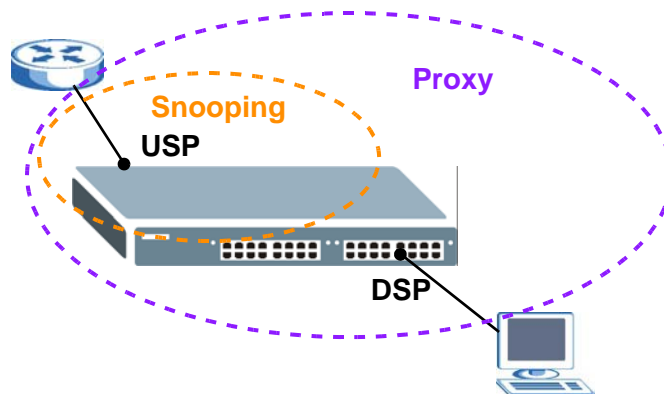
MLD Messages

A multicast router or switch periodically sends general queries to MLD hosts to update the multicast forwarding table. When an MLD host wants to join a multicast group, it sends an MLD Report message for that address.

An MLD Done message is equivalent to an IGMP Leave message. When an MLD host wants to leave a multicast group, it can send a Done message to the router or switch. If the leave mode is not set to `immediate`, the router or switch sends a group-specific query to the port on which the Done message is received to determine if other devices connected to this port should remain in the group.

MLD Port Role

A port on the Switch can be either a downstream port or upstream port in MLD. A downstream port (**DSP** in the figure) connects to MLD hosts and acts as a multicast router to send MLD queries and listen to the MLD host's Report and Done messages. An upstream port (**USP** in the figure) connects to a multicast router and works as a host to send Report or Done messages when receiving queries from a multicast router.

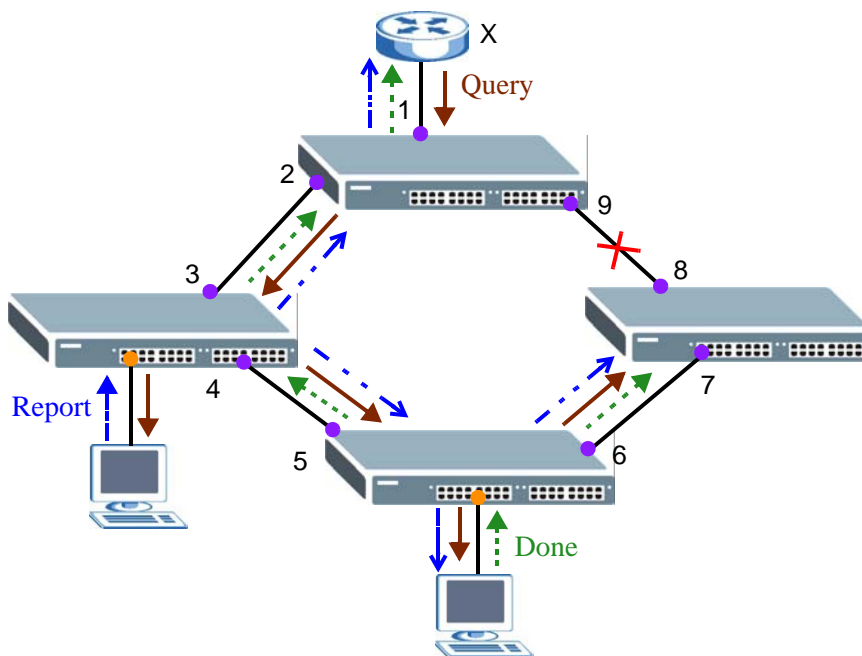


MLD Snooping-Proxy

MLD snooping-proxy is a ZyXEL-proprietary feature. IPv6 MLD proxy allows only one upstream interface on a switch, while MLD snooping-proxy supports more than one upstream port on a switch. The upstream port in MLD snooping-proxy can report group changes to a connected multicast router and forward MLD messages to other upstream ports. This helps especially when you want to have a network that uses STP to provide backup links between switches and also performs MLD snooping and proxy functions. MLD snooping-proxy, like MLD proxy, can minimize MLD control messages and allow better network performance.

In MLD snooping-proxy, if one upstream port is learned via snooping, all other upstream ports on the same device will be added to the same group. If one upstream port requests to leave a group, all other upstream ports on the same device will also be removed from the group.

In the following MLD snooping-proxy example, all connected upstream ports (1 ~7) are treated as one interface. The connection between ports 8 and 9 is blocked by STP to break the loop. If there is one query from a router (X) or MLD Done or Report message from any upstream port, it will be broadcast to all connected upstream ports.



37.2 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 98 ipv6 User-input Values

| COMMAND | DESCRIPTION |
|-------------------------|--|
| <i>interface-type</i> | VLAN. The Switch supports only the VLAN interface type at the time of writing. |
| <i>interface-number</i> | A VLAN ID number. |

The following section lists the commands for this feature.

Table 99 ipv6 address Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>interface vlan <1-4094></code> | Enters config-route-domain mode for the specified VLAN. Creates the VLAN, if necessary. | C | 13 |
| <code>ipv6</code> | Globally enables IPv6 in this VLAN. The Switch then creates a link-local address automatically. Use "show ipv6" to see the generated address. | C | 13 |
| <code>ipv6 address <ipv6-address>/<prefix></code> | Manually configures a static IPv6 global address for the VLAN. | C | 13 |
| <code>ipv6 address <ipv6-address>/<prefix> eui-64</code> | Manually configures a static IPv6 global address for the VLAN and have the interface ID be generated automatically using the EUI-64 format. | C | 13 |

Table 99 ipv6 address Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>ipv6 address <ipv6-address>/<prefix> link-local</code> | Manually configures a static IPv6 link-local address for the VLAN. | C | 13 |
| <code>ipv6 address autoconfig</code> | Use the command to have the Switch generate an IPv6 global address automatically in this VLAN after the Switch obtains the VLAN network information from a router. Note: Make sure an IPv6 router is available in the VLAN network before using this command on the Switch. | C | 13 |
| <code>ipv6 address default-gateway <gateway-ipv6-address></code> | Sets the default gateway for the VLAN. When an interface cannot find a routing information for a frame's destination, it forwards the packet to the default gateway. | C | 13 |
| <code>ipv6 address dhcp client <iana></code> | Sets the Switch to get a non-temporary IP address from the DHCP server. | C | 13 |
| <code>ipv6 address dhcp client <iana> [rapid-commit]</code> | Sets the Switch to get a non-temporary IP address from the DHCP server for this VLAN. Optionally, sets the Switch to send its DHCPv6 Solicit message with a Rapid Commit option to obtain information from the DHCP server by a rapid two-message exchange. The Switch discards any Reply messages that do not include a Rapid Commit option. The DHCPv6 server should also support the Rapid Commit option to have it work well. | C | 13 |
| <code>ipv6 address dhcp client information refresh minimum <600-4294967295></code> | Sets the time interval (in seconds) at which the Switch exchanges other configuration information with a DHCPv6 server again. | C | 13 |
| <code>ipv6 address dhcp client option <[dns] [domain-list]></code> | Sets the Switch to obtain DNS server IPv6 addresses or a list of domain names from the DHCP server. | C | 13 |
| <code>no ipv6</code> | Disables IPv6 in this VLAN. | C | 13 |
| <code>no ipv6 address <ipv6-address>/<prefix></code> | Removes a specified static global address. | C | 13 |
| <code>no ipv6 address <ipv6-address>/<prefix> eui-64</code> | Removes a specified static global address whose interface ID was generated using the EUI-64 format. | C | 13 |
| <code>no ipv6 address <ipv6-address>/<prefix> link-local</code> | Removes a specified static link-local address. | C | 13 |
| <code>no ipv6 address autoconfig</code> | Disables IPv6 address autoconfiguration in this VLAN. | C | 13 |
| <code>no ipv6 address default-gateway</code> | Removes the default gateway address for this VLAN. | C | 13 |
| <code>no ipv6 address dhcp client</code> | Disables the DHCP client feature in this VLAN. | C | 13 |
| <code>no ipv6 address dhcp client [rapid-commit]</code> | sets the Switch to not include a Rapid Commit option in its DHCPv6 Solicit message for this VLAN. | C | 13 |
| <code>no ipv6 address dhcp client option</code> | Sets the Switch to not obtain the DNS server information from the DHCP server. | C | 13 |
| <code>no ipv6 address dhcp client option <[dns] [domain-list]></code> | Sets the Switch to not obtain DNS server IPv6 addresses or a list of domain names from the DHCP server. | C | 13 |
| <code>restart ipv6 dhcp client vlan <1-4094></code> | Sets the Switch to send a Release message for the assigned IPv6 address to the DHCP server and start DHCP message exchange again. | E | 13 |
| <code>show ipv6</code> | Displays IPv6 settings in all VLANs on the Switch. | E | 3 |

Table 99 ipv6 address Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|---|
| show ipv6 dhcp | Displays the Switch's DHCPv6 DUID. | E | 3 |
| show ipv6 dhcp vlan <1-4094> | Displays the DHCPv6 settings for the specified VLAN, including DHCPv6 mode, the IA type and the IAID. | E | 3 |
| show ipv6 <interface-type> <interface-number> | Displays IPv6 settings for a specified interface on the Switch. | E | 3 |

Table 100 ipv6 dhcp relay Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| ipv6 dhcp relay vlan <1-4094> helper-address <remote-dhcp-server> | Enables DHCPv6 relay agent and configures the remote DHCP server address for the specified VLAN. | C | 13 |
| ipv6 dhcp relay vlan <1-4094> option interface-id | Sets the Switch to add the interface-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCP server. | C | 13 |
| ipv6 dhcp relay vlan <1-4094> option remote-id <remote-id> | Sets the Switch to add the remote-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCP server. This also specifies a string (up to 64 printable ASCII characters) to be carried in the remote-ID option. | C | 13 |
| no ipv6 dhcp relay vlan <1-4094> | Disables DHCPv6 relay agent in the specified VLAN. | C | 13 |
| no ipv6 dhcp relay vlan <1-4094> option interface-id | Sets the Switch to not add the interface-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCP server. | C | 13 |
| no ipv6 dhcp relay vlan <1-4094> option remote-id | Sets the Switch to not add the remote-ID option in the DHCPv6 requests from the clients in the specified VLAN before the Switch forwards them to a DHCP server. | C | 13 |

Table 101 ipv6 dhcp trust Command Summary

| COMMAND | DESCRIPTION | M | P |
|------------------------------------|---|---|----|
| ipv6 dhcp trust | Enables IPv6 DHCP trust to set whether ports are trusted or untrusted ports for DHCP snooping. All ports are untrusted ports by default. | C | 13 |
| no ipv6 dhcp trust | Disables IPv6 DHCP trust. All ports are automatically trusted. | C | 13 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |
| ipv6 dhcp trust | Configures this port as a trusted port. Trusted ports are connected to DHCPv6 servers or other switches. | C | 13 |
| no ipv6 dhcp trust | Configures this port as an untrusted port. Untrusted ports are connected to subscribers, and the Switch discards DHCPv6 packets from untrusted ports in the following situations: <ul style="list-style-type: none"> The packet is a DHCPv6 server packet (for example, ADVERTISE, REPLY, or RELAY-REPLY). The source MAC address and source IP address in the packet do not match any of the current bindings. | C | 13 |

Table 102 ipv6 icmp and ping6 Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <pre>ipv6 icmp error-interval <0-2147483647> [bucket-size <1-200>]</pre> | <p>Sets the average transmission rate of ICMPv6 error messages the Switch generates, such as Destination Unreachable message, Packet Too Big message, Time Exceeded message and Parameter Problem message.</p> <p><i>error-interval</i>: specifies a time period (in milliseconds) during which packets of up to the bucket size (10 by default) can be transmitted. 0 means no limit.</p> <p>Note: The Switch applies the time interval in increments of 10. For example, if you set a time interval from 1280 to 1289 milliseconds, the Switch uses the time interval of 1280 milliseconds.</p> <p><i>bucket-size</i>: Defines the maximum number of packets which are allowed to transmit in a given time interval. If the bucket is full, subsequent error messages are suppressed.</p> | C | 13 |
| <pre>ping6 <ipv6-address> [-i <interface-type> <interface-number>] [-t] [-l <1-1452>] [-n <1-65535>] [-s <ipv6-address>]</pre> | <p>Sends IPv6 ping packets to the specified Ethernet device.</p> <p><i>interface-type</i>: the Switch supports only the VLAN interface type at the time of writing.</p> <p><i>interface-number</i>: The VLAN ID to which the Ethernet device belongs.</p> <p>-l <1-1452>: Specifies the size of the ping packet.</p> <p>-t: Sends ping packets to the Ethernet device indefinitely. Press [CTRL]+C to terminate the Ping process.</p> <p>-n <1-65535>: Specifies how many times the Switch sends the ping packets.</p> <p>-s <ipv6-address>: Specifies the source IPv6 address of the ping packets.</p> | E | 0 |
| <pre>show ipv6 mtu</pre> | <p>The Switch uses Path MTU Discovery to discover Path MTU (PMTU), that is, the minimum link MTU of all the links in a path to the destination. If the Switch receives an ICMPv6 Packet Too Big error message after sending a packet, it adjusts the next packet size according to the suggested MTU in the error message.</p> <p>Displays IPv6 path MTU information on the Switch.</p> | E | 3 |

Table 103 ipv6 mld snooping-proxy Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <pre>clear ipv6 mld snooping-proxy statistics all</pre> | Removes all MLD snooping-proxy statistics of the Switch. | E | 13 |
| <pre>clear ipv6 mld snooping-proxy statistics port</pre> | Removes the MLD snooping-proxy statistics of the port(s). | E | 13 |
| <pre>clear ipv6 mld snooping-proxy statistics system</pre> | Removes the MLD snooping-proxy statistics of the Switch. | E | 13 |
| <pre>clear ipv6 mld snooping-proxy statistics vlan</pre> | Removes the MLD snooping-proxy statistics of the multicast VLAN(s). | E | 13 |
| <pre>interface port-channel <port-list></pre> | Enters config-interface mode for the specified port(s). | C | 13 |
| <pre>ipv6 mld snooping-proxy filtering group-limited</pre> | Enables multicast group limits for MLD snooping-proxy. | C | 13 |

Table 103 ipv6 mld snooping-proxy Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| ipv6 mld snooping-proxy filtering group-limited number <number> | Sets the maximum number of the multicast groups the port(s) is allowed to join. <i>number</i> : 0 - 255 | C | 13 |
| ipv6 mld snooping-proxy filtering profile <name> | Assigns the specified MLD filtering profile to the port(s). If MLD filtering is enabled on the Switch, the port(s) can only join the multicast groups in the specified profile. | C | 13 |
| no ipv6 mld snooping-proxy filtering group-limited | Disables multicast group limits for MLD snooping. | C | 13 |
| no ipv6 mld snooping-proxy filtering profile | Disables MLD filtering on the port(s) and allows the port(s) to join any group. | C | 13 |
| ipv6 mld snooping-proxy | Enables IPv6 MLD snooping-proxy on the Switch. | C | 13 |
| ipv6 mld snooping-proxy 8021p-priority <0-7> | Sets the default IEEE 802.1p priority in the MLD messages. | C | 13 |
| ipv6 mld snooping-proxy filtering | Enables MLD filtering on the Switch. | C | 13 |
| ipv6 mld snooping-proxy filtering profile <name> start-address <ip> end-address <ip> | Adds an MLD filtering profile and sets the range of the multicast address(es). | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> | Enables MLD snooping-proxy on the specified VLAN. | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> | Specifies the downstream port(s) on the Switch. The port(s) will work as a multicast router to send MLD queries and listen to the MLD host's join and leave messages. | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> fast-leave-timeout <2-16775168> | Sets the fast leave timeout (in milliseconds) for the specified downstream port(s). This defines how many seconds the Switch waits for an MLD report before removing an MLD snooping membership entry (learned on a downstream port) when an MLD Done message is received on this port from a host. | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> leave-timeout <2-16775168> | Set the MLD snooping normal leave timeout (in milliseconds) the Switch uses to update the forwarding table for the specified downstream port(s). This defines how many seconds the Switch waits for an MLD report before removing an MLD snooping membership entry (learned on a downstream port) when an MLD Done message is received on this port from a host. | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> mode <immediate normal fast> | Sets the leave mode for the specified downstream port(s) in a specified VLAN. This specifies whether Switch removes an MLD snooping membership entry (learned on a downstream port) immediately (<i>immediate</i>) or wait for an MLD report before the normal (<i>normal</i>) or fast (<i>fast</i>) leave timeout when an MLD leave message is received on this port from a host. | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream query-interval <1000-31744000> | Sets the amount of time (in milliseconds) between general query messages sent by the downstream port. | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream query-max-response-time <1000-25000> | Sets the maximum time (in milliseconds) that the Switch waits for a response to a general query message sent by the downstream port. | C | 13 |

Table 103 ipv6 mld snooping-proxy Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| ipv6 mld snooping-proxy vlan <vlan-id> upstream interface port-channel <port-list> | Specifies the upstream (host) port(s) on the Switch. The port(s) will work as an MLD host to send join or leave messages when receiving queries from the multicast router. | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream last-listener-query-interval <1-8387584> | Sets the the amount of time (in miliseconds) between the MLD group-specific queries sent by an upstream port when an MLD Done message is received. This value should be exactly the same as what's configured in the connected multicast router. This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table after a Done message is received. When an MLD Done message is received, the Switch sets the entry's lifetime to be: last-listener-query-interval x robustness-variable | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream query-interval <1000-31744000> | Sets the amount of time (in miliseconds) between general query messages sent by the router connected to the upstream port. This value should be exactly the same as what's configured in the connected multicast router. This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table. When an MLD Report message is received, the Switch sets the timeout period of the entry to be: query-interval x robustness-variable + query-max-response-time | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream query-max-response-time <1000-25000> | Sets the amount of time (in miliseconds) the router connected to the upstream port waits for a response to an MLD general query message. This value should be exactly the same as what's configured in the connected multicast router. This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table. When an MLD Report message is received, the Switch sets the timeout period of the entry to be: query-interval x robustness-variable + query-max-response-time When an MLD Done message is received, the Switch sets the entry's lifetime to be: last-listener-query-interval x robustness-variable | C | 13 |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream robustness-variable <1-25> | Sets the number of queries. A multicast address entry (learned only on an upstream port by snooping) is removed from the forwarding table when there is no response to the configured number of queries sent by the router connected to the upstream port. This value should be exactly the same as what's configured in the connected multicast router. This value is used to calculate the amount of time an MLD snooping membership entry (learned only on the upstream port) can remain in the forwarding table. | C | 13 |
| no ipv6 mld snooping-proxy | Disables IPv6 MLD snooping-proxy on the Switch. | C | 13 |
| no ipv6 mld snooping-proxy filtering | Disables IPv6 MLD filtering on the Switch. | C | 13 |

Table 103 ipv6 mld snooping-proxy Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| no ipv6 mld snooping-proxy filtering profile <name> | Removes the specified MLD filtering profile. | C | 13 |
| no ipv6 mld snooping-proxy filtering profile <name> start-address <ip> end-address <ip> | Removes the range of multicast address(es) from the specified filtering profile. | C | 13 |
| no ipv6 mld snooping-proxy vlan <vlan-id> | Disables MLD snooping-proxy on the specified VLAN. | C | 13 |
| no ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> | Sets the specified port(s) to not be a downstream port(s) for the specified VLAN. | C | 13 |
| no ipv6 mld snooping-proxy vlan <vlan-id> upstream interface port-channel <port-list> | Sets the specified port(s) to not be an upstream port(s) for the specified VLAN. | C | 13 |
| show interfaces config <port-list> mld snooping-proxy filtering group-limited | Displays whether MLD filtering is enabled and the maximum MLD group number for the specified port(s). | E | 3 |
| show interfaces config <port-list> mld snooping-proxy filtering profile | Displays the name of the filtering profile for the specified port(s). | E | 3 |
| show ipv6 mld snooping-proxy | Displays whether MLD snooping-proxy is enabled on the Switch and on which VLAN(s). | E | 3 |
| show ipv6 mld snooping-proxy filtering profile | Displays whether MLD filtering is enabled on the Switch and the filtering profile settings. | E | 3 |
| show ipv6 mld snooping-proxy group | Displays the multicast group addresses learned on the Switch's ports. | E | 3 |
| show ipv6 mld snooping-proxy statistics interface port-channel <port-list> | Displays the MLD snooping-proxy statistics of the specified port(s). | E | 3 |
| show ipv6 mld snooping-proxy statistics system | Displays the MLD snooping-proxy statistics of the Switch. | E | 3 |
| show ipv6 mld snooping-proxy statistics vlan <vlan-list> | Displays the MLD snooping-proxy statistics of the specified multicast VLAN(s). | E | 3 |
| show ipv6 mld snooping-proxy vlan <vlan-id> | Displays MLD proxy settings for the specified VLAN. | E | 3 |
| show ipv6 multicast | Displays the multicast group addresses learned on the Switch's ports and the timeout values. | E | 3 |

Table 104 ipv6 nd Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>interface vlan <1-4094></code> | Enters config-route-domain mode for the specified VLAN. Creates the VLAN, if necessary. | C | 13 |
| <code>ipv6 nd dad-attempts <0-600></code> | Sets the number of consecutive neighbor solicitations the Switch sends for this VLAN. The Switch uses Duplicate Address Detection (DAD) with neighbor solicitation and advertisement messages to check whether an IPv6 address is already in use before assigning it to an interface, such as the link-local address it creates through stateless address autoconfiguration for this VLAN. To turn off the DAD for this VLAN, set the number of DAD attempts to 0. | C | 13 |
| <code>ipv6 nd managed-config-flag</code> | Configures the Switch to set the “managed address configuration” flag (the M flag) to 1 in IPv6 router advertisements, which means hosts use DHCPv6 to obtain IPv6 stateful addresses. | C | 13 |
| <code>ipv6 nd ns-interval <1000-3600000></code> | Specifies the time interval (in milliseconds) at which neighbor solicitations are re-sent for this VLAN. | C | 13 |
| <code>ipv6 nd other-config-flag</code> | Configures the Switch to set the “Other stateful configuration” flag (the O flag) to 1 in IPv6 router advertisements, which means hosts use DHCPv6 to obtain additional configuration settings, such as DNS information. | C | 13 |
| <code>ipv6 nd prefix <ipv6-prefix>/<prefix-length> <[valid-lifetime <0-4294967295>] [preferred-lifetime <0-4294967295>] [no-autoconfig] [no-onlink] [no-advertise]></code> | Sets the Switch to include the specified IPv6 prefix, prefix length and optional parameters in router advertisements for this VLAN. <i>valid-lifetime</i> : sets how long in seconds the prefix is valid for on-link determination. <i>preferred-lifetime</i> : sets how long (in seconds) that addresses generated from the prefix via stateless address autoconfiguration remain preferred. <i>no-autoconfig</i> : indicates the hosts can not use this prefix for stateless address autoconfiguration. <i>no-onlink</i> : indicates this prefix can not be used for on-link determination. <i>no-advertise</i> : sets the Switch to not include the specified IPv6 prefix, prefix length and optional parameters in router advertisements for this VLAN. | C | 13 |
| <code>ipv6 nd prefix <ipv6-prefix>/<prefix-length></code> | Sets the Switch to include the specified IPv6 prefix and prefix length in router advertisements for this VLAN. | C | 13 |
| <code>ipv6 nd ra interval minimum <3-1350> maximum <4-1800></code> | Specifies the minimum and maximum time intervals at which the Switch sends router advertisements for this VLAN. | C | 13 |
| <code>ipv6 nd ra lifetime <0-9000></code> | Sets how long (in seconds) the router in router advertisements can be used as a default router for this VLAN. | C | 13 |
| <code>ipv6 nd ra suppress</code> | Sets the Switch to not send router advertisements and responses to router solicitations for this VLAN. | C | 13 |
| <code>ipv6 nd reachable-time <1000-2147483647></code> | Specifies how long (in milliseconds) a neighbor is considered reachable for this VLAN. | C | 13 |
| <code>no ipv6 nd dad-attempts</code> | Resets the number of the DAD attempts to the default settings (3). | C | 13 |

Table 104 ipv6 nd Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| no ipv6 nd managed-config-flag | Configures the Switch to set the “managed address configuration” flag (the M flag) to 0 in IPv6 router advertisements, which means hosts do not use DHCPv6 to obtain IPv6 stateful addresses. | C | 13 |
| no ipv6 nd ns-interval | Resets the time interval between retransmissions of neighbor solicitations to the default setting (3000 milliseconds). | C | 13 |
| no ipv6 nd other-config-flag | Configures the Switch to set the “Other stateful configuration” flag (the O flag) to 0 in IPv6 router advertisements, which means hosts do not use DHCPv6 to obtain additional configuration settings, such as DNS information. | C | 13 |
| no ipv6 nd prefix <ipv6-prefix>/<prefix-length> | Sets the Switch to not include the specified IPv6 prefix and prefix length in router advertisements for this VLAN. | C | 13 |
| no ipv6 nd ra interval | Resets the minimum and maximum time intervals between retransmissions of router advertisements for this VLAN to the default settings. | C | 13 |
| no ipv6 nd ra lifetime | Resets the lifetime of a router in router advertisements to the default setting (9000 seconds). | C | 13 |
| no ipv6 nd ra suppress | Enables the sending of router advertisements and responses to router solicitations on this interface. | C | 13 |
| no ipv6 nd reachable-time | Resets the reachable time of a neighbor to the default setting (60000 milliseconds). | C | 13 |
| ipv6 hop-limit <1-255> | Sets the maximum number of hops on which an IPv6 packet is allowed to transmit before it is discarded by an IPv6 router, which is similar to the TTL field in IPv4. | C | 13 |
| ipv6 route <ipv6-prefix>/<prefix-length> <next-hop> | Creates a static route to forward packets with the specified IPv6 prefix and prefix length to a specific gateway. | C | 13 |
| ipv6 route <ipv6-prefix>/<prefix-length> <next-hop> <interface-type> <interface-number> | Creates a static route to forward packets with the specified IPv6 prefix and prefix length to a specific gateway in a VLAN. | C | 13 |
| no ipv6 hop-limit | Resets the maximum number of hops in router advertisements to the default setting. | C | 13 |
| no ipv6 route <ipv6-prefix>/<prefix-length> | Removes an IPv6 static route. | C | 13 |
| show ipv6 route | Displays IPv6 routing information on the Switch. | E | 3 |
| show ipv6 route static | Displays static IPv6 routing information on the Switch. | E | 3 |
| show ipv6 prefix | Displays all IPv6 prefix information on the Switch. | E | 3 |
| show ipv6 prefix <interface-type> <interface-number> | Displays IPv6 prefix information for the specified interface (VLAN). | E | 3 |

Table 105 ipv6 neighbor Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| clear ipv6 neighbor | Removes all IPv6 neighbor information on the Switch. | E | 13 |
| clear ipv6 neighbor <interface-type> <interface-number> | Removes IPv6 neighbor information for a specified interface on the Switch. | E | 13 |

Table 105 ipv6 neighbor Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| ipv6 neighbor <interface-type> <interface-number> <ipv6-address> <mac-address> | Creates a static IPv6 neighbor entry in the IPv6 cache for this VLAN. | C | 13 |
| no ipv6 neighbor <interface-type> <interface-number> <ipv6-address> | Removes a static IPv6 neighbor entry from the IPv6 cache. | C | 13 |
| show ipv6 neighbor | Displays IPv6 settings on the Switch and its neighbor devices. | E | 3 |
| show ipv6 neighbor <interface-type> <interface-number> | Displays IPv6 neighbor devices for a specified interface on the Switch. | E | 3 |
| show ipv6 router | Displays all IPv6 router advertisement information on the Switch. | E | 3 |
| show ipv6 router <interface-type> <interface-number> | Displays IPv6 router advertisement information for a specified interface on the Switch. | E | 3 |

Table 106 ipv6 snooping policy Command Summary

| COMMAND | DESCRIPTION | M | P |
|---------------------------------------|---|---|----|
| ipv6 snooping policy <name> | Enters sub-command mode for creating an IPv6 snooping policy. | C | 13 |
| limit address-count <number> | Sets the number of IPv6 addresses and prefixes learned using the IPv6 snooping policy. The maximum limit address count is the maximum size of the IPv6 source guard binding table. | C | 13 |
| no limit address-count | Removes the maximum limit address count setting. | C | 13 |
| prefix-glean | Allows the Switch to learn the IPv6 prefix and length from DHCPv6 sniffed packets. | C | 13 |
| no prefix-glean | Disables IPv6 prefix gleaning. | C | 13 |
| protocol dhcp | Enables DHCP snooping to have the Switch sniff DHCPv6 packets sent from a DHCPv6 server to a DHCPv6 client. | C | 13 |
| no protocol dhcp | Disables DHCP snooping. | C | 13 |
| no ipv6 snooping policy <name> | Removes the specified IPv6 snooping policy. | C | 13 |
| interface vlan <1-4094> | Enters config-route-domain mode for the specified VLAN. Creates the VLAN, if necessary. | C | 13 |
| ipv6 snooping attach-policy <name> | Enables a IPv6 snooping policy on the specified VLAN interface. | C | 13 |
| no ipv6 snooping attach-policy | Disables the IPv6 snooping policy on the VLAN interface. | C | 13 |
| show ipv6 snooping policy [<name>] | Displays all or the specified IPv6 snooping policy settings. | E | 3 |

Table 107 ipv6 source binding Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| clear ipv6 source binding [address <ipv6-address> prefix <ipv6- address/prefix-length>] | Removes all or the dynamic IPv6 source binding entries snooped with the specified IPv6 address and/or prefix address. | E | 13 |
| ipv6 source binding <ipv6-address ipv6-address/prefix-length> [mac <mac-addr>] [vlan <vlan-id>] [interface port-channel <port- list>] | Creates an IPv6 source binding table entry. | C | 13 |

Table 107 ipv6 source binding Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>no ipv6 source binding <ipv6-address ipv6-address/prefix-length></code> | Removes a static IPv6 source binding entry with the specified IPv6 address and/or prefix address. | C | 13 |
| <code>show ipv6 source binding</code> | Displays all the current dynamic and static bindings on the Switch. | E | 3 |
| <code>show ipv6 source binding [ipv6-address ipv6-address/prefix-length] [mac <mac-address>] [vlan <vlan-id>] [interface port-channel <port-list>] [dhcpv6-snooping static]></code> | Displays the IPv6 source binding table, based on the specified parameters. | E | 3 |
| <code>show ipv6 source binding count</code> | Displays the number of IPv6 source binding entries. | E | 3 |

Table 108 ipv6 source guard Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>ipv6 source-guard policy <name></code> | Enters sub-command mode for creating an IPv6 source guard policy. | C | 13 |
| <code> permit link-local</code> | Allows data traffic from all link-local addresses. | C | 13 |
| <code> no permit link-local</code> | Blocks data traffic from all link-local addresses. | C | 13 |
| <code> validate address</code> | Sets IPv6 source guard to forward valid IPv6 addresses that are stored in the binding table. | C | 13 |
| <code> no validate address</code> | Sets IPv6 source guard to not forward valid IPv6 addresses that are stored in the binding table. | C | 13 |
| <code> validate prefix</code> | Sets IPv6 source guard to forward valid IPv6 prefixes that are stored in the binding table. | C | 13 |
| <code> no validate prefix</code> | Sets IPv6 source guard to not forward valid IPv6 prefixes that are stored in the binding table. | C | 13 |
| <code>show ipv6 source-guard policy [<name>]</code> | Displays information of all IPv6 source guard policies on the Switch or the specified IPv6 source guard policy. | E | 3 |

37.3 Command Examples

This example shows how to enable IPv6 in VLAN 1 and display the link-local address the Switch automatically generated and other IPv6 information for the VLAN.

```
sysname# config
sysname(config)# interface vlan 1
sysname(config-vlan)# ipv6
sysname(config-vlan)# exit
sysname(config)# exit
sysname# show ipv6 vlan 1
VLAN : 1 (VLAN1)
  IPv6 is enabled.
  MTU is 1500 bytes.
  ICMP error messages limited to 10 every 100 milliseconds.
  Stateless Address Autoconfiguration is disabled.
  Link-Local address is fe80::219:cbff:fe6f:9159 [preferred]
  Global unicast address(es):
  Joined group address(es):
    ff02::2
    ff01::1
    ff02::1
    ff02::1:ff6f:9159
  ND DAD is enabled, number of DAD attempts: 1
  ND NS-interval is 1000 milliseconds
  ND reachable time is 30000 milliseconds
  ND router advertised managed config flag is disable
  ND router advertised other config flag is disable
  ND router advertisements are sent every 200 to 600 seconds
  ND router advertisements lifetime 1800 seconds
```

This example shows how to manually configure two IPv6 addresses (one uses the EUI-64 format, one doesn't) in VLAN 1, and then display the result. Before using `ipv6 address` commands, you have to enable IPv6 in the VLAN and this has the Switch generate a link-local address for the interface.

There are three addresses created in total for VLAN 1. The address “2001:db8:c18:1:219:cbff:fe00:1/64” is created with the interface ID “219:cbff:fe00:1” generated using the EUI-64 format. The address “2001:db8:c18:1::12b/64” is created exactly the same as what you entered in the command.

```

sysname# config
sysname(config)# interface vlan 1
sysname(config-vlan)# ipv6
sysname(config-vlan)# ipv6 address 2001:db8:c18:1::127/64 eui-64
sysname(config-vlan)# ipv6 address 2001:db8:c18:1::12b/64
sysname(config-vlan)# exit
sysname(config)# exit
sysname# show ipv6
VLAN : 1 (VLAN1)
  IPv6 is enabled.
  MTU is 1500 bytes.
  ICMP error messages limited to 10 every 100 milliseconds.
  Stateless Address Autoconfiguration is disabled.
  Link-Local address is fe80::219:cbff:fe00:1 [preferred]
  Global unicast address(es) :
    2001:db8:c18:1::12b/64 [preferred]
    2001:db8:c18:1:219:cbff:fe00:1/64 [preferred]
  Joined group address(es) :
    ff02::1:ff00:12b
    ff02::2
    ff01::1
    ff02::1
    ff02::1:ff6f:9159
  ND DAD is enabled, number of DAD attempts: 1
  ND NS-interval is 1000 milliseconds
  ND reachable time is 30000 milliseconds
  ND router advertised managed config flag is disable
  ND router advertised other config flag is disable
  ND router advertisements are sent every 200 to 600 seconds
  ND router advertisements lifetime 1800 seconds

```

This example shows the Switch owns (L displays in the **T** field) two manually configured (permanent) IP addresses, 2001::1234 and fe80::219:cbff:fe00:1. It also displays a neighbor fe80::2d0:59ff:feb8:103c in VLAN 1 is reachable from the Switch.

```

sysname# show ipv6 neighbor
Address                               MAC                               S  T Interface
-----
2001::1234                            00:19:cb:0:0:0:1                R  L  vlan 1
fe80::219:cbff:fe00:1                 00:19:cb:0:0:0:1                R  L  vlan 1
fe80::2d0:59ff:feb8:103c              00:d0:59:b8:10:3c              R  D  vlan 1

S: reachable(R), stale(S), delay(D), probe(P), invalid(IV), incomplete(I), unknown(?)
T: local(L), dynamic(D), static(S), other(O)

```

The following table describes the labels in this screen.

Table 109 show ipv6 neighbor

| LABEL | DESCRIPTION |
|-----------|---|
| Address | This is the IPv6 address of the Switch or a neighboring device. |
| MAC | This is the MAC address of the neighboring device or itself. |
| S | This field displays whether the neighbor IPv6 interface is reachable. In IPv6, "reachable" means an IPv6 packet can be correctly forwarded to a neighbor node (host or router) and the neighbor can successfully receive and handle the packet. The available options in this field are: <ul style="list-style-type: none"> reachable (R): The interface of the neighboring device is reachable. (The Switch has received a response to the initial request.) stale (S): The last reachable time has expired and the Switch is waiting for a response to another initial request. The field displays this also when the Switch receives an unrequested response from the neighbor's interface. delay (D): The neighboring interface is no longer known to be reachable, and traffic has been sent to the neighbor recently. The Switch delays sending request packets for a short to give upper-layer protocols a chance to determine reachability. probe (P): The Switch is sending request packets and waiting for the neighbor's response. invalid (IV): The neighbor address is with an invalid IPv6 address. unknown (?): The status of the neighboring interface can not be determined for some reason. incomplete (I): Address resolution is in progress and the link-layer address of the neighbor has not yet been determined (see RFC 2461). The interface of the neighboring device did not give a complete response. |
| T | This field displays the type of an address mapping to a neighbor interface. The available options in this field are: <ul style="list-style-type: none"> other (O): none of the following type. dynamic (D): The IP address to MAC address can be successfully resolved using IPv6 Neighbor Discovery protocol (See Neighbor Discovery Protocol (NDP)). Is it similar as IPv4 ARP (Address Resolution protocol). static (S): The interface address is statically configured. local (L): A Switch interface is using the address. |
| Interface | This field displays the IPv6 interface. |
| Expire | This displays how long (<i>hh:mm:ss</i>) an address can be used before it expires. If an address is manually configured, it displays permanent (never expires). |

This example sends ping requests to an Ethernet device with IPv6 address fe80::2d0:59ff:feb8:103c in VLAN 1. The device also responds the pings.

```

sysname# ping6 ffe80::2d0:59ff:feb8:103c -i vlan 1
PING6(56=40+8+8 bytes) fe80::219:cbff:fe00:1 --> fe80::2d0:59ff:feb8:103c
16 bytes from fe80::2d0:59ff:feb8:103c, icmp_seq=0 hlim=64 time=1.0 ms
16 bytes from fe80::2d0:59ff:feb8:103c, icmp_seq=1 hlim=64 time=1.0 ms
16 bytes from fe80::2d0:59ff:feb8:103c, icmp_seq=2 hlim=64 time=1.0 ms

--- fe80::2d0:59ff:feb8:103c ping6 statistics ---
3 packets transmitted, 3 packets received, 0.0 % packet loss
round-trip min/avg/max = 1.0 /1.0 /1.0 ms
sysname#

```

This example configures a static IPv6 route to forward packets with IPv6 prefix 2100:: and prefix length 64 to the gateway with IPv6 address fe80::219:cbff:fe01:101 in VLAN 1.

```

sysname# config
sysname(config)# ipv6 route 2100::/64 fe80::219:cbff:fe01:101 vlan 1
sysname(config)# exit
sysname# show ipv6 route
  Terminology:
    C - Connected, S - Static
Destination/Prefix Length                                Type
Next Hop                                                Interface
-----
2001:db8:c18:1::/64                                    C
::                                                       VLAN1
2100::/64                                              S
fe80::219:cbff:fe01:101                               VLAN1
sysname#

```

37.4 Example - Enabling IPv6 on Windows XP/2003

By default, Windows XP and Windows 2003 support IPv6. This example shows you how to use the `ipv6 install` command on Windows XP/2003 to enable IPv6. This also displays how to use the `ipconfig` command to see auto-generated IP addresses.

```

C:\>ipv6 install
Installing...
Succeeded.

C:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . :
    IP Address. . . . . : 10.1.1.46
    Subnet Mask . . . . . : 255.255.255.0
    IP Address. . . . . : fe80::2d0:59ff:feb8:103c%4
    Default Gateway . . . . . : 10.1.1.254

Tunnel adapter Teredo Tunneling Pseudo-Interface:

    Connection-specific DNS Suffix  . :
    IP Address. . . . . : fe80::5445:5245:444f%5
    Default Gateway . . . . . :

Tunnel adapter Automatic Tunneling Pseudo-Interface:

    Connection-specific DNS Suffix  . :
    IP Address. . . . . : fe80::5efe:10.1.1.46%2
    Default Gateway . . . . . :

```

IPv6 is installed and enabled by default in Windows Vista. Use the “ipconfig” command to check your automatic configured IPv6 address as well. You should see at least one IPv6 address available for the interface on your computer.

37.5 Example - HTTP Accessing the Switch Using IPv6

How you access the Switch using HTTP varies depending on the operating system (OS) and the type of browser you use and the type of address you want to access.



It's recommended to use Internet Explorer 7.0 or FireFox to access the Switch's web GUI.

Table 110 Specifying the Switch Address for HTTP Access

| OS | DESTINATION | INTERNET EXPLORER 7.0 | FIREFOX |
|---------------|----------------------|--|---------|
| Windows XP | A link-local address | Use <code>http://address</code> The address should be converted using the following procedure. <ol style="list-style-type: none"> 1. Use a dash “-” to replace each colon “:” in an IPv6 address. 2. Append the Ethernet interface identifier you want to use to connect to the Switch. But replace the percentage character “%” with “s”. 3. Append “.ipv6-literal.net” at the end. For example, the Switch uses an address <code>fe80::1234:5678</code> . The Ethernet interface identifier you want to use on your computer to access the Switch is <code>%4</code> . You have to type the following to access the Switch. <code>http://fe80--1234-5678-1s4.ipv6-literal.net.</code> | |
| | A global address | Use <code>http://[address]</code> For example, <code>http://[fe80--1234-5678-1]</code> | |
| Windows Vista | A link-local address | | |
| | A global address | | |

This example shows you how to access the Switch using HTTP on Windows XP.

- 1 Make sure you have enabled IPv6 on your computer (see Section 37.4). Use the `ipconfig` command in the command prompt to check the IPv6 address on your computer. The example uses an interface with address “`fe80::2d0:59ff:feb8:103c`” to

access the Switch. So its Ethernet interface identifier is %4 and will be used later to make a ping.

```
C:\>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : 
    IP Address. . . . . : 10.1.1.46
    Subnet Mask . . . . . : 255.255.255.0
    IP Address. . . . . : fe80::2d0:59ff:feb8:103c%4
    Default Gateway . . . . . : 10.1.1.254
```

- 2 Check the Switch IPv6 address(es) you want to ping. In this example, there are two IPv6 addresses in VLAN 1. One is a link-local address (fe80::219:cbff:fe00:1/64) and the other one is a global address (2001::1234/64).

```
sysname# show ipv6

VLAN ID      : 1
IPv6 Status  : Enable

Origin      IP Address/PrefixLength      Status      Expire
-----
manual      fe80::219:cbff:fe00:1/64      preferred   permanent
manual      2001::1234/64                  preferred   permanent
```

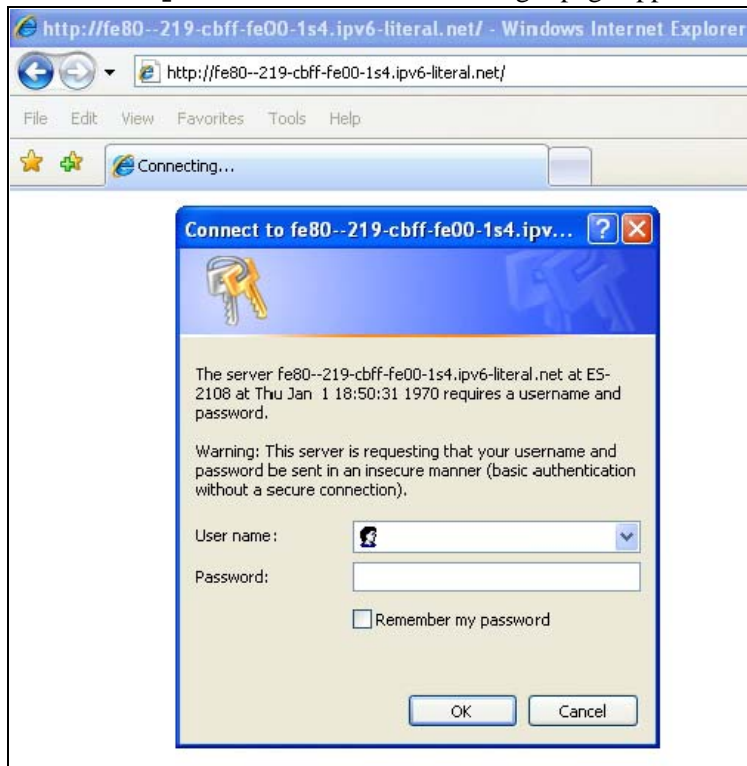
- 3 In order to access the Switch through its link-local address, do the address conversion (See [Table 110](#) on page 159).
 - 3a Use a dash “-” to replace each colon “:” in an IPv6 address. Then the address becomes:


```
fe80--219-cbff-fe00-1
```
 - 3b In the step 1, the Ethernet interface identifier you want to use to connect to the Switch is “%4”. Replace the percentage character “%” with “s” and then append it to the address. The address becomes:

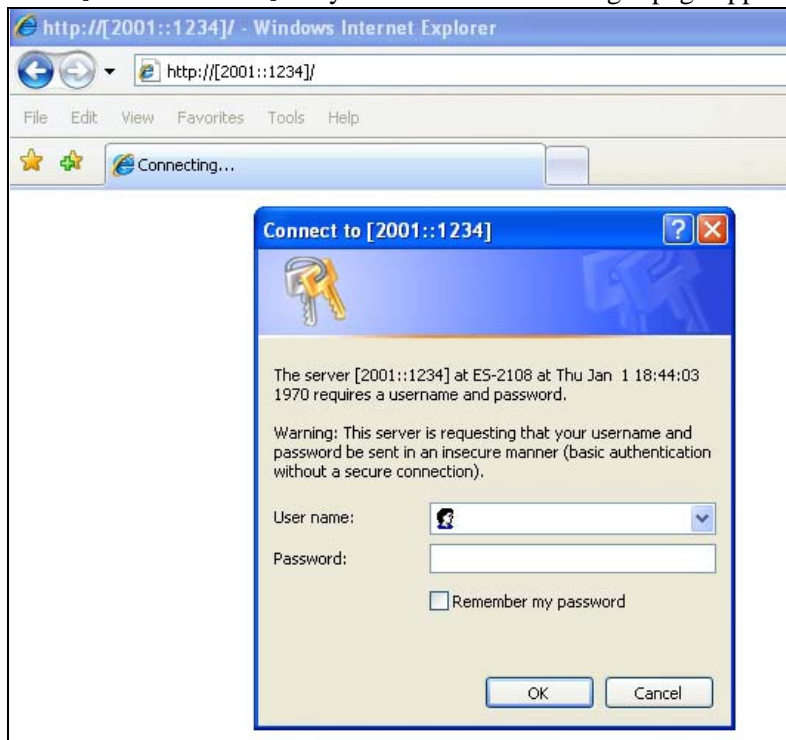

```
fe80--219-cbff-fe00-1s4
```
 - 3c Append “.ipv6-literal.net” at the end. The address becomes:


```
fe80--219-cbff-fe00-1s4.ipv6-literal.net
```


Open an Internet Explorer 7.0 browser and type `http://fe80--219-cbff-fe00-1s4.ipv6-literal.net`. The login page appears.



- 4 Alternatively, you can use the global address to access the Switch. Type `http://[2001::1234]` on your browser and the login page appears.



Layer 2 Protocol Tunnel (L2PT) Commands

38.1 Command Summary

The following section lists the commands for this feature.

Table 111 l2pt Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>clear l2protocol-tunnel</code> | Removes all layer 2 protocol tunneling counters. | E | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for configuring the specified port(s). | C | 13 |
| <code>l2protocol-tunnel</code> | Enables layer 2 protocol tunneling for CDP (Cisco Discovery Protocol), STP (Spanning Tree Protocol) and VTP (VLAN Trunking Protocol) packets on the specified port(s). | C | 13 |
| <code>l2protocol-tunnel cdp</code> | Enables layer 2 protocol tunneling for CDP packets on the specified port(s). | C | 13 |
| <code>l2protocol-tunnel mode <access tunnel></code> | <p>Sets the L2PT mode for the specified port(s)</p> <p>access: for ingress ports at the edge of the service provider's network. The Switch encapsulates the incoming layer 2 protocol packets and forward them to the tunnel port(s).</p> <p>Note: You can enable L2PT services for STP, LACP, VTP, CDP, UDLD, and PAGP on the access port(s) only.</p> <p>tunnel: for egress ports at the edge of the service provider's network. The Switch decapsulates the encapsulated layer 2 protocol packets received on a tunnel port by changing the destination MAC address to the original one, and then forward them to an access port. If the service(s) is not enabled on an access port, the protocol packets are dropped.</p> | C | 13 |
| <code>l2protocol-tunnel point-to-point</code> | Enables point-to-point layer 2 protocol tunneling for LACP (Link Aggregation Control Protocol), PAGP (Port Aggregation Protocol) and UDLD (UniDirectional Link Detection) packets on the specified port(s). | C | 13 |
| <code>l2protocol-tunnel point-to-point lacp</code> | Enables point-to-point layer 2 protocol tunneling for LACP packets on the specified port(s). | C | 13 |
| <code>l2protocol-tunnel point-to-point pagp</code> | Enables point-to-point layer 2 protocol tunneling for PAGP packets on the specified port(s). | C | 13 |

Table 111 l2pt Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| l2protocol-tunnel point-to-point udlld | Enables point-to-point layer 2 protocol tunneling for UDLD packets on the specified port(s). | C | 13 |
| l2protocol-tunnel stp | Enables layer 2 protocol tunneling for STP packets on the specified port(s). | C | 13 |
| l2protocol-tunnel vtp | Enables layer 2 protocol tunneling for CDP packets on the specified port(s). | C | 13 |
| no l2protocol-tunnel | Disables layer 2 protocol tunneling for CDP, VTP and STP packets on the specified port(s). | C | 13 |
| no l2protocol-tunnel cdp | Disables layer 2 protocol tunneling for CDP packets on the specified port(s). | C | 13 |
| no l2protocol-tunnel point-to-point | Disables point-to-point layer 2 protocol tunneling for LACP, PAGP and UDLD packets on the specified port(s). | C | 13 |
| no l2protocol-tunnel point-to-point lacp | Disables point-to-point layer 2 protocol tunneling for LACP packets on the specified port(s). | C | 13 |
| no l2protocol-tunnel point-to-point pagp | Disables point-to-point layer 2 protocol tunneling for PAGP packets on the specified port(s). | C | 13 |
| no l2protocol-tunnel point-to-point udlld | Enables point-to-point layer 2 protocol tunneling for UDLD packets on the specified port(s). | C | 13 |
| no l2protocol-tunnel stp | Disables layer 2 protocol tunneling for STP packets on the specified port(s). | C | 13 |
| no l2protocol-tunnel vtp | Disables layer 2 protocol tunneling for VTP packets on the specified port(s). | C | 13 |
| l2protocol-tunnel | Enables layer 2 protocol tunneling on the Switch. | C | 13 |
| l2protocol-tunnel mac <mac-addr> | Sets the destination MAC address used for encapsulating layer 2 protocol packets received on an access port. | C | 13 |
| no l2protocol-tunnel | Disables layer 2 protocol tunneling on the Switch. | C | 13 |
| show l2protocol-tunnel | Displays layer 2 protocol tunneling settings and counters for all ports. | E | 13 |
| show l2protocol-tunnel interface port-channel <port-list> | Displays layer 2 protocol tunneling settings and counters for the specified port(s). | E | 13 |

38.2 Command Examples

This example enables L2PT on the Switch and sets the destination MAC address for encapsulating layer 2 protocol packets received on an access port.

```

sysname# configure
sysname(config)# l2protocol-tunnel
sysname(config)# l2protocol-tunnel mac 00:10:23:45:67:8e
sysname(config)#

```

This example enables L2PT for STP, CDP and VTP packets on port 3. It also sets L2PT mode to **access** for this port.

```
sysname(config)# interface port-channel 3
sysname(config-interface)# l2protocol-tunnel
sysname(config-interface)# l2protocol-tunnel mode access
sysname(config-interface)# exit
sysname(config)# exit
```

This example sets L2PT mode to **tunnel** for port 4.

```
sysname(config)# interface port-channel 4
sysname(config-interface)# l2protocol-tunnel mode tunnel
sysname(config-interface)# exit
sysname(config)# exit
```

This example displays L2PT settings and status on port 3. You can also see how many CDP, STP, VTP, LACP, PAgP and UDLD packets received on this port are encapsulated, decapsulated or dropped.

```
sysname# show l2protocol-tunnel interface port-channel 3

Status : Running
Layer 2 Protocol Tunneling: Enable
Destination MAC Address: 00:10:23:45:67:8e

Port  Protocol  State  Encapsulation  Decapsulation  Drop
-----  -
      3          cdp  Enable         0              0              0
          stp  Enable        1280           2548           0
          vtp  Enable         0              0              0
          lacp Disable         0              0              0
          pagp Disable         0              0              0
          udld Disable         0              0              0
sysname#
```

Link Layer Discovery Protocol (LLDP) Commands

39.1 LLDP Overview

The LLDP (Link Layer Discovery Protocol) is a layer 2 protocol. It allows a network device to advertise its identity and capabilities on the local network. It also allows the device to maintain and store information from adjacent devices which are directly connected to the network device. This helps an administrator discover network changes and perform necessary network reconfiguration and management. The device information is encapsulated in the LLDPDUs (LLDP data units) in the form of TLV (Type, Length, Value). Device information carried in the received LLDPDUs is stored in the standard MIB.

The Switch supports these basic management TLVs.

- End of LLDPDU (mandatory)
- Chassis ID (mandatory)
- Port ID (mandatory)
- Time to Live (mandatory)
- Port Description (optional)
- System Name (optional)
- System Description (optional)
- System Capabilities (optional)
- Management Address (optional)

The Switch also supports the IEEE 802.1 and IEEE 802.3 organizationally-specific TLVs.

Annex F of the LLDP specification defines the following set of IEEE 802.1 organizationally specific TLVs:

- Port VLAN ID TLV (optional)
- Port and Protocol VLAN ID TLV (optional)

Annex G of the LLDP specification defines the following set of IEEE 802.3 Organizationally Specific TLVs:

- MAC/PHY Configuration/Status TLV (optional)
- Power via MDI TLV (optional)
- Link Aggregation TLV (optional)
- Maximum Frame Size TLV (optional)

The optional TLVs are inserted between the Time To Live TLV and the End of LLDPDU TLV.

LLDP-MED (Link Layer Discovery Protocol for Media Endpoint Devices) is an enhanced extension to LLDP especially for voice applications. You can use LLDP-MED to advertise location-based information of emergency calls and/or network policies for voice/video streaming.

39.2 Command Summary

The following section lists the commands for this feature.

Table 112 lldp Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for configuring the specified port(s). | C | 13 |
| <code>lldp admin-status <disabled tx-only rx-only tx-rx></code> | Sets LLDP operating mode. disabled: the port(s) can't send or receive LLDP packets. tx-only: the port(s) can only send LLDP packets. rx-only: the port(s) can only receive LLDP packets. tx-rx: the port(s) can send or receive LLDP packets. | C | 13 |
| <code>lldp basic-tlv management-address</code> | Enables the sending of Management Address TLVs on the port(s). | C | 13 |
| <code>lldp basic-tlv port-description</code> | Enables the sending of Port Description TLVs on the port(s). | C | 13 |
| <code>lldp basic-tlv system-capabilities</code> | Enables the sending of System Capabilities TLVs on the port(s). | C | 13 |
| <code>lldp basic-tlv system-description</code> | Enables the sending of System Description TLVs on the port(s). | C | 13 |
| <code>lldp basic-tlv system-name</code> | Enables the sending of System Name TLVs on the port(s). | C | 13 |
| <code>lldp med location civic [county <county>] [city <city>] [division <division>] [neighbor <neighbor>] [street <street>] [leading-street-direction <value>] [trailing-street-suffix <value>] [street-suffix <value>] [house-number <num>] [house-number-suffix <value>] [landmark <landmark>] [additional-location <value>] [name <value>] [zip-code <value>] [building <value>] [unit <value>] [floor <value>] [room-number <value>] [place-type <value>] [postal-community-name <value>] [post-office-box <value>] [additional-code <value>]</code> | Sets civic location information, such as street address and city name. | C | 13 |

Table 112 lldp Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| lldp med location coordinate [latitude <north south> <value>] [longitude <west east > <value>] [altitude <meters floor> <value>] [datum <WGS84 NAD83-NAVD88 NAD83- MLLW>] | Sets coordinate location information. Latitude <i>value</i> : -90° to 90° Longitude <i>value</i> : -180° to 180° Altitude <i>value</i> : -2097151 to 2097151 in meters or - 2097151 to 2097151 in the number of floors | C | 13 |
| lldp med location elin <number> | Sets location information of a caller by its ELIN (Emergency Location Identifier Number). <i>number</i> : a ten-digit phone number | C | 13 |
| lldp med network-policy <voice voice-signaling guest- voice guest-voice- signaling softphone- voice video- conferencing streaming- video video-signaling> [tagged untagged] [vlan <vlan- id>] [priority <priority>] [dscp <dscp>] | Sets a network policy for the specified application. | C | 13 |
| lldp med topology-change- notification | Enables the sending of LLDP-MED topology change traps when devices are connected to or disconnected from the specified ports. | C | 13 |
| lldp notification | Enables the sending of LLDP traps. | C | 13 |
| lldp org-specific-tlv dot1 port-protocol-vlan-id | Enables the sending of IEEE 802.1 Port and Protocol VLAN ID TLVs, which contains the VLAN ID and indicates whether the VLAN is enabled and supported. | C | 13 |
| lldp org-specific-tlv dot1 port-vlan-id | Enables the sending of IEEE 802.1 Port VLAN ID TLVs, which contains the port's VLAN ID. | C | 13 |
| lldp org-specific-tlv dot3 link-aggregation | Enables the sending of IEEE 802.3 Link Aggregation TLVs, which shows the link aggregation status of the port(s). | C | 13 |
| lldp org-specific-tlv dot3 mac- phy | Enables the sending of IEEE 802.3 MAC/PHY Configuration/Status TLV, which shows duplex and rate settings and indicates whether auto negotiation is supported on the port. | C | 13 |
| lldp org-specific-tlv dot3 max- frame-size | Enables the sending of IEEE 802.3 Maximum Frame Size TLVs on the port(s). | C | 13 |
| lldp org-specific-tlv dot3 power-via-mdi | Enables the sending of IEEE 802.3 Power via MDI TLVs, which indicates whether power can be supplied via a media dependent interface (MDI) on the port(s). | C | 13 |
| lldp org-specific-tlv med location | Enables the sending of location TLVs on the port(s). | C | 13 |
| lldp org-specific-tlv med network-policy | Enables the sending of network policy TLVs on the port(s). | C | 13 |
| no lldp admin-status | Resets the port(s) to default setting on sending or receiveing LLDP packets. | C | 13 |
| no lldp basic-tlv management- address | Disables the sending of Management Address TLVs on the port(s). | C | 13 |

Table 112 lldp Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| no lldp basic-tlv port-description | Disables the sending of Port Description TLVs on the port(s). | C | 13 |
| no lldp basic-tlv system-capabilities | Disables the sending of System Capabilities TLVs on the port(s). | C | 13 |
| no lldp basic-tlv system-description | Disables the sending of System Description TLVs on the port(s). | C | 13 |
| no lldp basic-tlv system-name | Disables the sending of System Name TLVs on the port(s). | C | 13 |
| no lldp med location | Deletes all location identification. | C | 13 |
| no lldp med location <civic coordinate elin> | Deletes location identification of the specified type. | C | 13 |
| no lldp med network-policy | Deletes network policies for all connected media endpoint devices. | C | 13 |
| no lldp med network-policy <voice voice-signaling guest-voice guest-voice-signaling softphone-voice video-conferencing streaming-video video-signaling> | Deletes network policies for the specified applications. | C | 13 |
| no lldp med topology-change-notification | Disables the sending of LLDP-MED topology change traps. | C | 13 |
| no lldp notification | Disables the sending of LLDP traps. | C | 13 |
| no lldp org-specific-tlv dot1 port-protocol-vlan-id | Disables the sending of IEEE 802.1 Port and Protocol VLAN ID TLVs on the port(s). | C | 13 |
| no lldp org-specific-tlv dot1 port-vlan-id | Disables the sending of IEEE 802.1 Port VLAN ID TLVs on the port(s). | C | 13 |
| no lldp org-specific-tlv dot3 link-aggregation | Disables the sending of IEEE 802.3 Link Aggregation TLVs on the port(s). | C | 13 |
| no lldp org-specific-tlv dot3 mac-phy | Disables the sending of IEEE 802.3 MAC/PHY Configuration/Status TLVs on the port(s). | C | 13 |
| no lldp org-specific-tlv dot3 max-frame-size | Disables the sending of IEEE 802.3 Maximum Frame Size TLVs on the port(s). | C | 13 |
| no lldp org-specific-tlv dot3 power-via-mdi | Disables the sending of IEEE 802.3 Power via MDI TLVs on the port(s). | C | 13 |
| lldp | Enables the LLDP feature on the Switch. | C | 13 |
| lldp reinitialize-delay <1-10> | Sets a number of seconds for LLDP wait to initialize on a port. | C | 13 |
| lldp transmit-delay <1-8192> | Sets the delay (in seconds) between the successive LLDPDU transmissions initiated by value or status changes in the Switch MIB. | C | 13 |

Table 112 lldp Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| lldp transmit-hold <2-10> | Sets the time-to-live (TTL) multiplier of the LLDP packets. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP packets transmitting interval. Note: Make sure the LLDP packet transmitting interval is shorter than its TTL to have the Switch's device information being updated in the neighboring devices before it ages out. | C | 13 |
| lldp transmit-interval <5-32768> | Sets the interval (in seconds) the Switch waits before sending LLDP packets. | C | 13 |
| no lldp | Disables the LLDP feature on the Switch. | C | 13 |
| show lldp config | Displays the global LLDP settings on the Switch. | E | 3 |
| show lldp config interface port-channel <port-list> | Displays the LLDP settings on the specified port(s). | E | 3 |
| show lldp info local | Displays the Switch's device information. | E | 3 |
| show lldp info local interface port-channel <port-list> | Displays the LLDP information for the specified port(s). | E | 3 |
| show lldp info remote | Displays the device information from the neighboring devices. | E | 3 |
| show lldp info remote interface port-channel <port-list> | Displays the neighboring device information received on the specified port(s). | E | 3 |
| show lldp statistic | Displays LLDP statistics on the Switch. | E | 3 |
| show lldp statistic interface port-channel <port-list> | Displays LLDP statistics of the specified port(s). | E | 3 |
| clear lldp statistic | Resets the LLDP statistics counters to zero. | E | 13 |
| clear lldp remote_info | Deletes all device information from the neighboring devices. | E | 13 |
| clear lldp remote_info interface port-channel <port-list> | Deletes remote device information on the specified port(s). | E | 13 |

39.3 Command Examples

This example enables LLDP on the Switch, sets port 2 to send and receive LLDP packets and allows the Switch to send optional basic management TLVs (such as management-address, port-description and system-description TLVs) on port 2. This example also shows the LLDP settings on port 2 and global LLDP settings on the Switch.

```

sysname# configure
sysname(config)# lldp
sysname(config)# interface port-channel 2
sysname(config-interface)# lldp admin-status tx-rx
sysname(config-interface)# lldp basic-tlv management-address
sysname(config-interface)# lldp basic-tlv port-description
sysname(config-interface)# lldp basic-tlv system-description
sysname(config-interface)# exit
sysname(config)# exit
sysname# show lldp config interface port-channel 2
LLDP Port Configuration:
Port      AdminStatus      Notification      BasicTLV      Dot1TLV      Dot3TLV
  2        tx-rx             Disable           P-D-M         --           ----
Basic TLV Flags: (P)Port Description, (N)System Name, (D)System
Description
                  (C)System Capabilities, (M)Management Address
802.1 TLV Flags: (P)Port & Protocol VLAN ID, (V)Port VLAN ID
802.3 TLV Flags: (L)Link Aggregation, (M)MAC/PHY Configuration/Status
                  (F)Maximun Frame Size, (P)Power Via MDI
sysname# show lldp config
LLDP Global Configuration:
      Active: Yes
Transmit Interval: 30 seconds
      Transmit Hold: 4
      Transmit Delay: 2 seconds
Reinitialize Delay: 2 seconds

sysname#

```

See [Chapter 16 on page 63](#) for DCB configuration and examples.

This example shows global Switch LLDP settings.

```

sysname# show lldp config
LLDP Global Configuration:
      Active: No
Transmit Interval: 30 seconds
      Transmit Hold: 4
      Transmit Delay: 2 seconds
Reinitialize Delay: 2 seconds

sysname#

```

The following table describes the labels in this screen.

Table 113 Switch LLDP settings

| LABEL | DESCRIPTION |
|--------------------|--|
| Active | This displays whether LLDP is enabled on the Switch. It is disabled by default. |
| Transmit Interval | This displays how long the Switch waits before sending LLDP packets. |
| Transmit Hold | This displays the time-to-live (TTL) multiplier of LLDP frames. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP packets transmitting interval. |
| Transmit Delay | This displays the delay (in seconds) between the successive LLDP PDU transmissions initiated by value or status changes in the Switch MIB. |
| Reinitialize Delay | This displays the number of seconds for LLDP to wait before initializing on a port. |

This example shows LLDP settings on a port.

```

sysname# show lldp config interface port-channel 2
LLDP Port Configuration:
Port      AdminStatus  Notification  BasicTLV  Dot1TLV  Dot3TLV
 2         tx-rx        Disable      -----  --EFA    ----
Basic TLV Flags: (P)Port Description, (N)System Name, (D)System Description
                 (C)System Capabilities, (M)Management Address
802.1 TLV Flags: (P)Port & Protocol VLAN ID, (V)Port VLAN ID
                 (E)DCBX ETS Configuration, (F)DCBX PFC Configuration
                 (A)DCBX Application Priority Configuration
802.3 TLV Flags: (L)Link Aggregation, (M)MAC/PHY Configuration/Status
                 (F)Maximum Frame Size, (P)Power Via MDI
sysname#

```

The following table describes the labels in this screen.

Table 114 LLDP settings on a port

| LABEL | DESCRIPTION |
|----------------|---|
| Port | This displays the port number with this LLDP configuration. |
| AdminStatus | This displays whether LLDP transmission and/or reception is allowed on this port. |
| Notification | This displays whether LLDP notification is enabled on this port. |
| BasicTLV | This shows which Basic TLC flags are enabled on this port. For example, 'N' is System Name. |
| Dot1TLV | This shows which 802.1 TLV flags are enabled on this port. For example, 'V' is Port VLAN ID. |
| Dot3TLV | This shows which 802.3 TLV flags are enabled on this port. For example, 'L' is Link Aggregation. |
| BasicTLV Flags | The Basic TLV Flags are (P) Port Description, (N) System Name, (D) System Description, (C) System Capabilities, and (M) Management Address. |

Table 114 LLDP settings on a port (continued)

| LABEL | DESCRIPTION |
|----------------|--|
| 802.1TLV Flags | The 802.1 TLV Flags are (P) Port & Protocol VLAN ID, (V) Port VLAN ID, (E) DCBX ETS Configuration, (F) DCBX PFC Configuration and (A) DCBX Application Priority Configuration. |
| 802.3TLV Flags | The 802.3 TLV Flags are (L) Link Aggregation, (M) MAC/PHY Configuration/Status, (F) Maximum Frame Size, and (P) Power Via MDI. |

This example shows global Switch LLDP statistics.

```

sysname# show lldp statistic
LLDP Global Statistic:
Neighbor Entries List Last Update:      0:00:00
New Neighbor Entries Count: 0
Neighbor Entries Deleted Count: 0
Neighbor Entries Dropped Count: 0
Neighbor Entries Ageout Count: 0

sysname#

```

The following table describes the labels in this screen.

Table 115 Switch LLDP statistics

| LABEL | DESCRIPTION |
|-----------------------------------|--|
| Neighbor Entries List Last Update | This displays the time the LLDP database was last updated for this and neighboring Switches. |
| New Neighbor Entries Count | This displays the number of new neighbors added to the LLDP database since the last update. |
| Neighbor Entries Deleted Count | This displays the number of neighbors deleted from the LLDP database since the last update. |
| Neighbor Entries Dropped Count | This displays the number of neighbors dropped from the LLDP database since the last update. |
| Neighbor Entries Ageout Count | This displays the number of neighbors with expired TTLs since the last update. |

This example shows LLDP statistics on a port

```

sysname# show lldp statistic interface port-channel 1
LLDP Port Statistic:
    Local Port: 1
Frames Discarded: 0
    Frames Invalid: 0
Frames Received: 0
    Frames Sent: 0
TLVs Unrecognized: 0
    TLVs Discarded: 0
Neighbor Ageouts: 0

sysname#

```

The following table describes the labels in this screen.

Table 116 LLDP statistics on a port

| LABEL | DESCRIPTION |
|-------------------|---|
| Local Port | This displays the port number with these LLDP statistics. |
| Frames Discarded | This displays the number of discarded frames on this port. |
| Frames Invalid | This displays the number of invalid frames on this port. |
| Frames Received | This displays the number of frames received on this port. |
| Frames Sent | This displays the number of frames sent on this port. |
| TLVs Unrecognized | This displays the number of unrecognized TLVS on this port. |
| TLVs Discarded | This displays the number of discarded TLVs on this port. |
| Neighbor Ageouts | This displays the number of neighbors with expired TTLs on this port. |

This example shows local Switch (the Switch you're accessing) LLDP information

```

sysname# show lldp info local
LLDP Global Local Device Information:
Chassis ID Subtype:          mac-address
  Chassis ID:                00:19:cb:00:00:02
  System Name:                sysname
System Description: V4.00(AAEW.0)b7 | 12/11/2012
System Capabilities Supported: Bridge
System Capabilities Enabled: Bridge
Management Address :
  Management Address Subtype: ipv4 / all-802
  Interface Number Subtype:   unknown
  Interface Number:          0
  Object Identifier:          0

sysname#

```

The following table describes the labels in this screen.

Table 117 Local LLDP Information

| LABEL | DESCRIPTION |
|--------------------------------------|--|
| LLDP Global Local Device Information | This contains the chassis ID subtype, chassis ID, and system name. |
| System Description | This shows the firmware version number and date released. |
| System Capabilities Supported | This shows what functionality the Switch supports. |
| System Capabilities Enabled | This shows what functionality is enabled on the Switch. |
| Management Address | This contains the management address subtype, interface number subtype, interface number, and object identifier. |

This example shows local Switch (the Switch you're accessing) LLDP information on a port.

```

sysname# show lldp info local interface port-channel 2
LLDP Local Device Information Detail:
    Local Port:          2
Port ID Subtype: local-assigned
    Port ID:            2
Port Description:
Extended TLV Info 802.1 OUI (hex value) = 00-80-c2
-Port VLAN ID
    -ID:                1
-DCBX Application Priority
    - ether-type:       fcoe    Priority:    2
-DCBX ETS Configuration
    -Willing Bit:       False
    -Max Traffic Classes: 3
    -Priority-Group 2:   Strict-priority, Priority-list:7
    -Priority-Group 1:   ETS Bandwidth 50%, Priority-list:3-6
    -Priority-Group 0:   ETS Bandwidth 50%, Priority-list:0-2
-DCBX PFC Configuration
    -Willing Bit:       True
    -PFC capability:    8
    -Priority enable list: 0-2
Extended TLV Info 802.3 OUI (hex value) = 00-12-0f
-MAC PHY Configuration & Status
    -AN Supported:      Y
    -AN Enabled:        Y
    -AN Advertised Capability: 1000baseTFD
    -Oper MAU type:    30
-Link Aggregation
    -Capability:        Y
    -Status:            N
    -Port ID:          2
-Max Frame Size
    -Frame Size:       1518
-----
sysname#

```

The following table describes the labels in this screen.

Table 118 Local Switch LLDP information on a port

| LABEL | DESCRIPTION |
|--------------------------------------|--|
| LLDP Local Device Information Detail | This displays the local port, port ID, and port description. |
| Port VLAN ID | This displays the VLAN ID for this port. |
| DCBX Application Priority | This displays the priority given to FCoE traffic on the Switch. |
| DCBX ETS Configuration | This displays the Willing Bit, Max Traffic Classes, and Traffic Class binding for each priority. |
| DCBX PFC Configuration | This displays the Willing Bit, PFC capability, and priority enable list. |
| MAC PHY Configuration & Status | This displays the AN Supported, AN Enabled, AN Advertised Capability, Oper MAU type |

Table 118 Local Switch LLDP information on a port (continued)

| LABEL | DESCRIPTION |
|------------------|--|
| Link Aggregation | This displays the capability, status, and port ID. |
| Max Frame Size | This displays the maximum frame size on this port. |

This example shows remote Switch (the Switch connected to the port on the Switch you're accessing) LLDP information.

```

sysname# show lldp info remote interface port-channel 2
LLDP Remote Device Information Detail:
    Local Port:                2
Chassis ID Subtype: mac-address
    Chassis ID: 00:19:cb:00:00:02
Port ID Subtype: local-assigned
    Port ID:                   47
    Time To Live:              120
Extended TLV Info 802.1 OUI (hex value) = 00-80-c2
-Port VLAN ID
    -ID:                       1
-DCBX Application Priority
    ether-type: fcoe           Priority: 2
-DCBX ETS Configuration
    -Willing Bit: False
    -Max Traffic Classes:      3
    -Priority-Group 7:         Strict-priority, Priority-list:-
    -Priority-Group 6:         Strict-priority, Priority-list:-
    -Priority-Group 5:         Strict-priority, Priority-list:-
    -Priority-Group 4:         Strict-priority, Priority-list:-
    -Priority-Group 3:         Strict-priority, Priority-list:-
    -Priority-Group 2:         Strict-priority, Priority-list:7
    -Priority-Group 1:         ETS Bandwidth 50%, Priority-list:3-6
    -Priority-Group 0:         ETS Bandwidth 50%, Priority-list:0-2
-DCBX PFC Configuration
    -Willing Bit: True
    -PFC capability:          8
    -Priority enable list: 0-2
Extended TLV Info 802.3 OUI (hex value) = 00-12-0f
-Max Frame Size
    -Frame Size: 1518
-----
sysname#

```

The following table describes the labels in this screen.

Table 119 Remote Switch LLDP information

| LABEL | DESCRIPTION |
|---------------------------------------|--|
| LLDP Remote Device Information Detail | This contains the following information: |
| Local Port | This is the local port number which receives the LLDPDU from the remote Switch. |
| Chassis ID Subtype | This displays how the chassis of the remote Switch is identified. |
| Chassis ID | This displays the chassis ID of the remote Switch. The chassis ID is identified by the chassis ID subtype. |

Table 119 Remote Switch LLDP information (continued)

| LABEL | DESCRIPTION |
|---|---|
| Port ID Subtype | This displays how the port is identified. |
| Port ID | This is the ID of the remote Switch. |
| Time To Live | This displays the time-to-live (TTL) multiplier of LLDP frames. The device information on the neighboring devices ages out and is discarded when its corresponding TTL expires. The TTL value is to multiply the TTL multiplier by the LLDP frames transmitting interval. |
| Extended TLV Info 802.1 OUI (hex value) | The 802.1 organizationally specific TLVs start with the 24-bit organizationally unique identifier (OUI) and a 1 byte organizationally specific subtype followed by data. Each organization is responsible for managing their subtypes. |
| Port VLAN ID | This TLV displays the VLAN ID for the remote Switch. |
| DCBX Application Priority | This TLV displays the priority given to FCoE traffic on the remote Switch. |
| DCBX ETS Configuration | This TLV displays the willing bit, ETS capability and traffic class settings configured by ETS on the remote Switch. |
| DCBX PFC Configuration | This TLV displays the willing bit, PFC capability, and enabled priority list configured by PFC on the remote Switch. |
| Extended TLV Info 802.3 OUI (hex value) | The 802.3 organizationally specific TLVs start with the 24-bit organizationally unique identifier (OUI) and a 1 byte organizationally specific subtype followed by data. Each organization is responsible for managing their subtypes. |
| Max Frame Size | This TLV displays the maximum transmission unit (MTU) sent by the remote Switch. |

Load Sharing Commands

40.1 Load Sharing Overview

The Switch learns the next-hop(s) using ARP and determines routing path(s) for a destination. The Switch supports Equal-Cost MultiPath (ECMP) to forward packets destined to the same device through different routing paths of equal path cost. This allows you to balance or share traffic loads between multiple routing paths when the Switch is connected to more than one next-hop. ECMP works with static routes or a routing protocol, such as OSPF.

With ECMP, packets are routed through the paths of equal cost according to the hash algorithm output.

The maximum number of paths for one ECMP (Equal-Cost MultiPath) route varies by Switch. A smaller number of maximum-paths means more ECMP routes are allowed and a larger number of maximum-paths means fewer ECMP routes are allowed.

The number of paths for a static route for ECMP cannot be bigger than the maximum-paths value.

Throughput may be influenced while configuring ECMP maximum-paths.

40.2 Command Summary

The following section lists the commands for this feature.

Table 120 load-sharing Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>ip load-sharing</code> | Enables load sharing on the Switch. | C | 13 |
| <code>ip load-sharing <sip sip-dip></code> | Sets the criteria the Switch uses to determine the routing path for a packe. <i>sip</i> : the Switch uses a hash algorithm to convert a packet's source IP address into a hash value which acts as an index to a route path. <i>sip-dip</i> : the Switch uses a hash algorithm to convert a packet's source and destination IP addresses into a hash value which acts as an index to a route path. | C | 13 |
| <code>ip load-sharing aging-time <0-86400></code> | Sets the time interval (from 0 to 86400 in increments of 10) in seconds at which the Switch sends an ARP request to update a resolved next-hop's MAC address. | C | 13 |
| <code>ip load-sharing discover-time <0-86400></code> | Sets the time interval (from 0 to 86400 in increments of 10) in seconds at which the Switch sends an ARP request to update an unresolved next-hop's MAC address. | C | 13 |

Table 120 load-sharing Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>ip load-sharing maximum-path</code> | Set the maximum number of paths for one ECMP (Equal-Cost MultiPath) route. | C | 13 |
| <code>no ip load-sharing</code> | Disables load sharing on the Switch. | C | 13 |

40.3 Command Examples

This example enables Equal-Cost MultiPath (ECMP) routing on the Switch and sets the Switch to use a packet's source and destination IP addresses to determine the routing path for the packet.

```
sysname# configure
sysname(config)# ip load-sharing
sysname(config)# ip load-sharing sip-dip
sysname(config)#
```

Logging Commands

Use these commands to manage system logs.

41.1 Command Summary

The following section lists the commands for this feature.

Table 121 logging Command Summary

| COMMAND | DESCRIPTION | M | P |
|---------------|-----------------------|---|----|
| show logging | Displays system logs. | E | 3 |
| clear logging | Clears system logs. | E | 13 |
| no logging | Clears system logs. | E | 13 |

41.2 Command Examples

This example displays the system logs.

```

sysname# show logging
 1 Thu Jan 1 00:02:08 1970 PP05 -WARN  SNMP TRAP 3: link up
 2 Thu Jan 1 00:03:14 1970      INFO  adjtime task pause 1 day
 3 Thu Jan 1 00:03:16 1970 PP0f -WARN  SNMP TRAP 26: Event On Trap
 4 Thu Jan 1 00:03:16 1970 PINI -WARN  SNMP TRAP 1: warm start
 5 Thu Jan 1 00:03:16 1970 PINI -WARN  SNMP TRAP 3: link up
 6 Thu Jan 1 00:03:16 1970 PINI  INFO  main: init completed
 7 Thu Jan 1 00:00:13 1970 PP26  INFO  adjtime task pause 1 day
 8 Thu Jan 1 00:00:14 1970 PP0f -WARN  SNMP TRAP 26: Event On Trap
 9 Thu Jan 1 00:00:14 1970 PINI -WARN  SNMP TRAP 0: cold start
10 Thu Jan 1 00:00:14 1970 PINI  INFO  main: init completed
11 Thu Jan 1 00:00:04 1970 PP05 -WARN  SNMP TRAP 3: link up
11 Thu Jan 1 00:00:04 1970 PP05 -WARN  SNMP TRAP 3: link up
sysname#

```

Login Account Commands

Use these commands to configure login accounts on the Switch.

42.1 Password Encryption

See [Section 56.1 on page 217](#) for information on this feature.

42.2 Command Summary

The following section lists the commands for this feature.

logins Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| show logins | Displays login account information. | E | 3 |
| logins username <name> password [cipher] <password> privilege <0-14> | Creates account with the specified user name and sets the password and privilege. The privilege level is applied the next time the user logs in. <i>name</i> : 1-32 alphanumeric characters. <i>password</i> : 32 alphanumeric characters. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used for password encryption. To encrypt the password, use the <code>password encryption</code> command. | C | 14 |
| no logins username <name> | Removes the specified account. | C | 14 |

42.3 Command Examples

This example creates a new user **user2** with privilege 13.

```

sysname# config
sysname(config)# logins username user2 password 1234 privilege 13
sysname(config)# exit
sysname# show logins
Login      Username          Privilege
1          user2             13
2
3
4

```

Loopguard Commands

Use these commands to configure the Switch to guard against loops on the edge of your network. The Switch shuts down a port if the Switch detects that packets sent out on the port loop back to the Switch.

43.1 Command Summary

The following section lists the commands for this feature.

Table 122 loopguard Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show loopguard</code> | Displays which ports have loopguard enabled as well as their status. | E | 3 |
| <code>loopguard</code> | Enables loopguard on the Switch. | C | 13 |
| <code>no loopguard</code> | Disables loopguard on the Switch. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>loopguard</code> | Enables the loopguard feature on the port(s). You have to enable loopguard on the Switch as well. The Switch shuts down a port if the Switch detects that packets sent out on the port loop back to the Switch. | C | 13 |
| <code>no loopguard</code> | Disables the loopguard feature on the port(s). | C | 13 |
| <code>clear loopguard</code> | Clears loopguard counters. | E | 13 |

43.2 Command Examples

This example enables loopguard on ports 1-3.

```

sysname# configure
sysname(config)# loopguard
sysname(config)# interface port-channel 1-3
sysname(config-interface)# loopguard
sysname(config-interface)# exit
sysname(config)# exit
sysname# show loopguard
  LoopGuard Status: Enable

  Port  Port      LoopGuard  Total      Total      Bad  Shutdown
  No   Status    Status     TxPkts     RxPkts     Pkts  Time
  ----  -
  1    Active    Enable     0          0          0    00:00:00 UTC Jan 1 1970
  2    Active    Enable     0          0          0    00:00:00 UTC Jan 1 1970
  3    Active    Enable     0          0          0    00:00:00 UTC Jan 1 1970
  4    Active    Disable    0          0          0    00:00:00 UTC Jan 1 1970
----- SNIP -----

```

The following table describes the labels in this screen.

Table 123 show loopguard

| LABEL | DESCRIPTION |
|------------------|---|
| LoopGuard Status | This field displays whether or not loopguard is enabled on the Switch. |
| Port No | This field displays the port number. |
| Port Status | This field displays whether or not the port is active. |
| LoopGuard Status | This field displays whether or not loopguard is enabled on the port. |
| Total TxPkts | This field displays the number of packets that have been sent on this port since loopguard was enabled on the port. |
| Total RxPkts | This field displays the number of packets that have been received on this port since loopguard was enabled on the port. |
| Bad Pkts | This field displays the number of invalid probe packets that were received on this port. |
| Shutdown Time | This field displays the last time the port was shut down because a loop state was detected. |

MAC Address Commands

Use these commands to look at the MAC address table and to configure MAC address learning. The Switch uses the MAC address table to determine how to forward frames.

44.1 Command Summary

The following section lists the commands for this feature.

Table 124 mac, mac-aging-time, and mac-flush Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| show mac-aging-time | Displays MAC learning aging time. | E | 3 |
| mac-aging-time <10-1000000> | Sets learned MAC aging time in seconds. | C | 13 |
| show mac address-table all [<sort>] | Displays MAC address table. You can sort by MAC address, VID or port. <i>sort</i> : MAC, VID, or PORT. | E | 3 |
| show mac address-table count | Displays the total number of MAC addresses in the MAC address table. | E | 3 |
| show mac address-table port <port-list> [<sort>] | Displays the MAC address table for the specified port(s). Sorted by MAC, Port or VID. <i>sort</i> : MAC, VID, or PORT. | E | 3 |
| show mac address-table static | Displays the static MAC address table. | E | 3 |
| show mac address-table vlan <vlan-list> [<sort>] | Displays the MAC address table for the specified VLAN(s). Optionally, sorted by MAC, Port or VID. <i>sort</i> : MAC, VID, or PORT. | E | 3 |
| show mac address-table mac <mac-addr> | Displays a specified MAC entry. | E | 3 |
| show mac address-table multicast | Displays the multicast MAC addresses learned by the Switch. | E | 3 |
| mac-flush [<port-num>] | Clears the MAC address table. Optionally, removes all learned MAC address on the specified port. | E | 13 |
| mac-transfer dynamic-to-filter mac <mac-addr> | Displays and changes a dynamically learned MAC address entry into a MAC filtering entry. | C | 13 |
| mac-transfer dynamic-to-filter interface port-channel <port-list> | Displays and changes all dynamically learned MAC address entries on the specified port(s) into MAC filtering entries. | C | 13 |
| mac-transfer dynamic-to-filter vlan <vlan-list> | Displays and changes all dynamically learned MAC address entries in the specified VLAN(s) into MAC filtering entries | C | 13 |
| mac-transfer dynamic-to-forward mac <mac-addr> | Displays and changes a dynamically learned MAC address entry into a MAC forwarding entry. | C | 13 |

Table 124 mac, mac-aging-time, and mac-flush Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| mac-transfer dynamic-to-forward interface port-channel <port- list> | Displays and changes all MAC addresses dynamically learned on the specified port(s) into static MAC addresses. | C | 13 |
| mac-transfer dynamic-to-forward vlan <vlan-list> | Displays and changes all dynamically learned MAC addresses in the specified VLAN(s) into static MAC addresses. | C | 13 |

44.2 Command Examples

This example shows the current MAC address table.

```

sysname# show mac address-table all
Port      VLAN ID      MAC Address      Type
2         1            00:00:e8:7c:14:80  Dynamic
2         1            00:04:80:9b:78:00  Dynamic
2         1            00:0f:fe:ad:58:ab   Dynamic
2         1            00:13:49:6b:10:55  Dynamic
2         1            00:13:d3:f0:7e:f0  Dynamic
2         1            00:18:f8:04:f5:67  Dynamic
2         1            00:80:c8:ef:81:d3  Dynamic
2         1            00:a0:c5:00:00:01  Dynamic

```

The following table describes the labels in this screen.

Table 125 show mac address-table

| LABEL | DESCRIPTION |
|-------------|--|
| Port | This is the port from which the above MAC address was learned. Drop: The entry is created from a filtering rule. |
| VLAN ID | This is the VLAN group to which this frame belongs. |
| MAC Address | This is the MAC address of the device from which this frame came. |
| Type | This shows whether the MAC address is dynamic (learned by the Switch) or static (manually entered using <code>mac-forward</code> commands, see Chapter 48 on page 191). |

MAC Authentication Commands

Use these commands to configure MAC authentication on the Switch.

45.1 MAC Authentication Overview

MAC authentication allows you to validate access to a port based on the MAC address and password of the client.



You also need to configure a RADIUS server (see [Chapter 66 on page 249](#)).

See also [Chapter 29 on page 109](#) for IEEE 802.1x port authentication commands and [Chapter 60 on page 229](#) for port security commands.

45.2 Command Summary

The following section lists the commands for this feature.

Table 126 mac-authentication Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show mac-authentication</code> | Displays MAC authentication settings for the Switch. | E | 3 |
| <code>show mac-authentication config</code> | Displays MAC authentication settings on a port by port basis with authentication statistics for each port. | E | 3 |
| <code>mac-authentication</code> | Enables MAC authentication on the Switch. | C | 13 |
| <code>mac-authentication nameprefix <name-string></code> | Sets the prefix appended to the MAC address before it is sent to the RADIUS server for authentication. The prefix can be up to 32 printable ASCII characters. | C | 13 |
| <code>mac-authentication password <name-string></code> | Sets the password sent to the RADIUS server for clients using MAC authentication. The password can be up to 32 printable ASCII characters. | C | 13 |
| <code>mac-authentication timeout <1-3000></code> | Specifies the amount of time before the Switch allows a client MAC address that fails authentication to try and authenticate again. This settings is superseded by the <code>mac-aging-time</code> command. | C | 13 |
| <code>no mac-authentication</code> | Disables MAC authentication on the Switch. | C | 13 |

Table 126 mac-authentication Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| no mac-authentication timeout | Sets the MAC address entries learned via MAC authentication to never age out. | C | 13 |
| interface port-channel <port-list> | Enables a port or a list of ports for configuration. | C | 13 |
| mac-authentication | Enables MAC authentication via a RADIUS server on the port(s). | C | 13 |
| no mac-authentication | Disables MAC authentication via a RADIUS server on the port(s). | C | 13 |
| mac-authentication trusted-vlan <vlan-list> | Sets the clients in the specified VLAN(s) to access the port(s) and the connected networks without MAC authentication. | C | 13 |
| no mac-authentication trusted-vlan <vlan-list> | Removes the trusted VLAN settings. | C | 13 |

45.3 Command Examples

This example enables MAC authentication on the Switch. Specifies the name prefix **clientName** and the MAC authentication password **Lech89**. Next, MAC authentication is activated on ports 1 - 5 and configuration details are displayed.

```

sysname(config)# mac-authentication
sysname(config)# mac-authentication nameprefix clientName
sysname(config)# mac-authentication password Lech89
sysname(config)# interface port-channel 1-5
sysname(config-interface)# mac-authentication
sysname(config-interface)# exit
sysname(config)# exit
sysname# show mac-authentication
NamePrefix:      clientName
Password:        Lech89
Update Time:     None
Deny Number:    0

```

MAC-based VLAN

Use these commands to bind a client source MAC address to a VLAN on the Switch.

46.1 MAC-based VLAN Overview

The MAC-based VLAN feature assigns incoming untagged packets to a VLAN and classifies the traffic based on the source MAC address of the packet. When untagged packets arrive at the switch, the source MAC address of the packet is looked up in a MAC to VLAN mapping table.

If an entry is found, the corresponding VLAN ID is assigned to the packet. The assigned VLAN ID is verified against the VLAN table. If the VLAN is valid, ingress processing on the packet continues; otherwise, the packet is dropped.

This feature allows users to change ports without having to reconfigure the VLAN, which allows better mobility. You can assign priority to the MAC-based VLAN and define a MAC to VLAN mapping table by entering a specified source MAC address in the MAC-based VLAN using a command. You can also delete a MAC-based VLAN entry using a command described below.

46.2 Command Summary

The following section lists the commands for this feature.

Table 127 MAC-based VLAN Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>mac-based-vlan name <name> source-mac <mac-addr> vlan <vlan-id> priority <0-7></code> | Adds a binding client source MAC address to a VLAN and sets priority level. Name: 1-32 alphanumeric characters | C | 13 |
| <code>no mac-based-vlan source-mac <mac-addr></code> | Removes a binding client source MAC address to a VLAN. | C | 13 |
| <code>show mac-based-vlan</code> | Show status of the MAC-based VLAN. | E | 13 |

46.3 Command Example:add source MAC address

This example adds a binding source MAC address to a MAC-based VLAN with MAC address 00:11:22:33:44:55, VLAN ID number 3 and priority level 6..

```
sysname(config)# mac-based-vlan name test source-mac 00:11:22:33:44:55 vlan
3 priority 6
sysname(config)
sysname(config)# exit
sysname# show mac-based-vlan
Index      Name      Source MAC      VLAN  Priority
1          test     00:11:22:33:44:55  3      6
```

46.4 Command Example:remove source MAC address

This example deletes a binding source MAC address to a MAC-based VLAN with MAC address 00:11:22:33:44:55.

```
sysname(config)# no mac-based-vlan source-mac 00:11:22:33:44:55
sysname(config)# exit
```

MAC Filter Commands

Use these commands to filter traffic going through the Switch based on the MAC addresses and VLAN group (ID).



Use the running configuration commands to look at the current MAC filter settings. See [Chapter 70 on page 262](#).



MAC filtering implementation differs across Switch models.

- Some models allow you to specify a filter rule and discard all packets with the specified MAC address (source or destination) and VID.
- Other models allow you to choose whether you want to discard traffic originating from the specified MAC address and VID (src), sent to the specified MAC address (dst) or both.

See [Section 47.2 on page 190](#) and [Section 47.3 on page 190](#) for examples.

47.1 Command Summary

The following section lists the commands for this feature.

Table 128 mac-filter Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>mac-filter name <name> mac <mac-addr> vlan <vlan-id></code> | Configures a static MAC address port filtering rule. <i>name</i> : 1-32 alphanumeric characters | C | 13 |
| <code>no mac-filter mac <mac-addr> vlan <vlan-id></code> | Deletes the specified MAC filter rule. | C | 13 |
| <code>mac-filter name <name> mac <mac-addr> vlan <vlan-id> inactive</code> | Disables a static MAC address port filtering rule. <i>name</i> : 1-32 alphanumeric characters | C | 13 |
| <code>no mac-filter mac <mac-addr> vlan <vlan-id> inactive</code> | Enables the specified MAC-filter rule. | C | 13 |
| <code>mac-filter name <name> mac <mac-addr> vlan <vlan-id> drop <src dst both></code> | Specifies the source and or destination filter parameters. | C | 13 |

47.2 Command Example

This example creates a MAC filter called “filter1” that drops packets coming from or going to the MAC address 00:12:00:12:00:12 on VLAN 1.

```
sysname(config)# mac-filter name filter1 mac 00:12:00:12:00:12 vlan 1
```

47.3 Command Example: Filter Source

The next example is for Switches that support the filtering of frames based on the source or destination MAC address only. This example creates a filter “sourcefilter” that drops packets originating from the MAC address af:af:01:01:ff:02 on VLAN 2.

```
sysname(config)# mac-filter name sourcefilter mac af:af:01:01:ff:02 vlan 2  
drop src
```

MAC Forward Commands

Use these commands to configure static MAC address forwarding.



Use the `mac` commands to look at the current `mac-forward` settings. See [Chapter 44 on page 183](#).

48.1 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 129 mac-forward User-input Values

| COMMAND | DESCRIPTION |
|-------------|------------------------------|
| <i>name</i> | 1-32 alphanumeric characters |

The following section lists the commands for this feature.

Table 130 mac-forward Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>mac-forward name <name> mac <mac-addr> vlan <vlan-id> interface <interface-id></code> | Configures a static MAC address forwarding rule. | C | 13 |
| <code>no mac-forward mac <mac-addr> vlan <vlan-id> interface <interface-id></code> | Removes the specified MAC forwarding entry, belonging to a VLAN group forwarded through an interface. | C | 13 |
| <code>mac-forward name <name> mac <mac-addr> vlan <vlan-id> interface <interface-id> inactive</code> | Disables a static MAC address forwarding rule. | C | 13 |
| <code>no mac-forward mac <mac-addr> vlan <vlan-id> interface <interface-id> inactive</code> | Enables the specified MAC address, belonging to a VLAN group forwarded through an interface. | C | 13 |

MAC Pinning Commands

Use these commands to configure MAC pinning to set a port or multiple ports to have priority over other ports in MAC address learning. That means when a MAC address (and VLAN ID) is learned on a MAC-pinning-enabled port, the MAC address will not be learned on any other port until the aging time for the dynamically learned MAC address in the table expires.

49.1 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 131 mac-pinning User-input Values

| COMMAND | DESCRIPTION |
|------------------|--|
| <i>port-list</i> | The port number or a range of port numbers that you want to configure. Possible values range from 1 to the number of ports on your Switch. |

The following section lists the commands for this feature.

Table 132 mac-pinning Command Summary

| COMMAND | DESCRIPTION | M | P |
|------------------------------------|---|---|----|
| mac-pinning | Enables MAC pinning on the Switch. | C | 13 |
| no mac-pinning | Disables MAC pinning on the Switch. | C | 13 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |
| mac-pinning | Enables MAC pinning on the specified port(s). | C | 13 |
| no mac-pinning | Disables MAC pinning on the specified port(s). | C | 13 |
| show mac-pinning | Displays MAC pinning settings | E | 3 |

49.2 Command Examples

This example enables MAC pinning on the Switch and port 3. It also shows the MAC pinning status.

```
sysname(config)# interface port-channel 3
sysname(config-interface)# mac-pinning
sysname(config-interface)# exit
sysname(config)# exit
sysname# show mac-pinning
```

MAC Pinning Status: Enable

| Port | Active |
|------|--------|
| 1 | No |
| 2 | No |
| 3 | Yes |
| 4 | No |
| 5 | No |
| 6 | No |
| 7 | No |
| 8 | No |
| 9 | No |
| 10 | No |
| 11 | No |
| 12 | No |
| 13 | No |
| 14 | No |
| 15 | No |
| 16 | No |
| 17 | No |
| 18 | No |
| 19 | No |
| 20 | No |
| 21 | No |
| 22 | No |
| 23 | No |
| 24 | No |
| 25 | No |
| 26 | No |
| 27 | No |
| 28 | No |

```
sysname#
```

Mirror Commands

Use these commands to copy a traffic flow for one or more ports to a monitor port (the port you copy the traffic to) so that you can examine the traffic on the monitor port without interference.

In local port mirroring, the mirroring ports (through which traffic you copy passes) and the monitor port are on the same device.

In remote port mirroring (RMirror), the mirroring ports and monitor port can be on different devices in a network. You can use it to monitor multiple switches across your network. The traffic from the source device's mirroring port(s) is sent to a reflector port for VLAN tagging and copied to the connected port(s). Traffic are then carried over the specified remote port mirroring (RMirror) VLAN and sent to the destination device's monitor port through the connected ports that connect to other switches.

Single-Destination RMirror

If the mirrored traffic is forwarded to one single destination switch, you can disable the reflector port. The Switch adds RMirror VLAN tag and forwards mirrored traffic from the mirroring port to the connected port directly.

Multi-Destination RMirror

If you configure more than one connected port on the source switch to forward the mirrored traffic to multiple destination switches, you must enable a reflector port on the source switch.



Use the running configuration commands to look at the current mirror settings. See [Chapter 70 on page 262](#).



`mirror-filter` commands are not supported on all Switch models.

50.1 Command Summary

The following section lists the commands for this feature.

Table 133 mirror Command Summary

| COMMAND | DESCRIPTION | M | P |
|-------------------------------------|---|---|----|
| mirror-port | Enables port mirroring on the Switch. | C | 13 |
| mirror-port <port-num> | Specifies the monitor port (the port to which traffic flow is copied) for port mirroring. | C | 13 |
| no mirror-port | Disables port mirroring on the Switch. | C | 13 |
| no mirror-port <port-num> | Removes the specified monitor port. <i>port-num</i> : in a modular switch, enter the port number preceded by a slot number and backslash (/). For example, 3/11 indicates port 11 on the card in the third slot. | C | 13 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). <i>port-list</i> : in a modular switch, enter the port number preceded by a slot number and backslash (/). For example, 3/11 indicates port 11 on the card in the third slot. Use a comma (,) to separate individual ports or a dash (-) to indicate a range of ports. For example, "3/11,4/5" or "3/7-3/9". | C | 13 |
| mirror | Enables port mirroring in the interface. | C | 13 |
| mirror dir <ingress egress both> | Enables port mirroring for incoming (<i>ingress</i>), outgoing (<i>egress</i>) or both incoming and outgoing (<i>both</i>) traffic. | C | 13 |
| no mirror | Disables port mirroring on the port(s). | C | 13 |

Table 134 mirror-filter Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| mirror-filter egress mac <mac-addr> | Copies outgoing frames with the specified source or destination MAC address from mirrored ports to the monitor port. | C | 13 |
| mirror-filter egress type <all dest src> | This command works with the previous command, <i>mirror-filter egress mac</i> . <i>all</i> : Specifies that the Switch should copy all outgoing traffic from mirrored ports. <i>dest</i> : Specifies that the Switch should copy all outgoing traffic with the specified destination MAC address from mirrored ports. <i>src</i> : Specifies that the Switch should copy outgoing traffic with the specified source MAC address from mirrored ports. | C | 13 |
| mirror-filter ingress mac <mac-addr> | Copies incoming frames matching with the specified source or destination MAC address from mirrored ports to the monitor port. | C | 13 |
| mirror-filter ingress type <all dest src> | This command works with the previous command, <i>mirror-filter ingress mac</i> . <i>all</i> : Specifies that the Switch should copy all outgoing traffic from mirrored ports. <i>dest</i> : Specifies that the Switch should copy all incoming traffic with the specified destination MAC address from mirrored ports. <i>src</i> : Specifies that the Switch should copy all incoming traffic with the specified source MAC address from mirrored ports. | C | 13 |
| show mirror | Displays mirror settings of the Switch. | E | 3 |

Table 135 rmirror Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>rmirror vlan <vlan-id></code> | Enters config-rmirror mode to create a remote port mirroring (RMirror) VLAN through which the mirrored traffic is forwarded. | C | 13 |
| <code>connected-port <port-list></code> | Sets the port(s) that helps forward mirrored traffic to other connected switches and/or receive mirrored traffic from other connected port in the same RMirror VLAN. | C | 13 |
| <code>no connected-port <port-list></code> | Removes the specified connected port(s) from this RMirror VLAN. | C | 13 |
| <code>destination monitor-port <port-num> <untagged tagged></code> | Sets the port to which you copy the traffic in order to examine it in more detail without interfering with the traffic flow on the original port(s). You can also set whether to add the RMirror VLAN tag to mirrored traffic on the monitor port. | C | 13 |
| <code>no destination monitor-port</code> | Removes the destination monitor port from this RMirror VLAN. | C | 13 |
| <code>inactive</code> | Disables the RMirror VLAN. | C | 13 |
| <code>no inactive</code> | Enables the RMirror VLAN. | C | 13 |
| <code>source 8021p-priority <0 - 7></code> | Sets the priority of the mirrored traffic in this VLAN. | C | 13 |
| <code>source mirror-port <port-list> dir <ingress egress both></code> | Sets the port(s) on which traffic is mirrored and the traffic flow to be copied to the monitor port when the Switch is the source device in remote port mirroring. | C | 13 |
| <code>no source mirror-port <port-list></code> | Sets the Switch to not mirror any traffic on the specified port(s). | C | 13 |
| <code>no source mirror-port <port-list> dir egress</code> | Sets the Switch to not mirror outgoing (egress) traffic on the specified port(s). | C | 13 |
| <code>no source mirror-port <port-list> dir ingress</code> | Sets the Switch to not mirror incoming (ingress) traffic on the specified port(s). | C | 13 |
| <code>source reflector-port</code> | Enables the source reflector port. | C | 13 |
| <code>source reflector-port <port-num></code> | Sets the port that adds the RMirror VLAN tag to all mirrored traffic and forwards traffic to the connected port(s) in the same RMirror VLAN. | C | 13 |
| <code>no source reflector-port</code> | Removes the source reflector port. | C | 13 |
| <code>no rmirror vlan <vlan-id></code> | Removes the specified RMirror VLAN. | C | 13 |
| <code>show rmirror vlan</code> | Displays all RMirror VLANs settings on the Switch. | E | 3 |
| <code>show rmirror vlan <vlan-id></code> | Displays the specified RMirror VLAN settings. | E | 3 |

50.2 Command Examples

This example enables port mirroring and copies outgoing traffic from ports 1, 4, 5, and 6 to port 3.

```

sysname(config)# mirror-port
sysname(config)# mirror-port 3
sysname(config)# interface port-channel 1,4-6
sysname(config-interface)# mirror
sysname(config-interface)# mirror dir egress

```

This example displays the mirror settings of the Switch after you configured in the example above.

```
sysname# show mirror
    Mirroring:  enable
    Monitor port:  3

    Mirrored port: 1,4-6
        Ingress:
        Egress: 1,4-6
        Both:
```

This example creates an RMirror VLAN with a VLAN ID of 200 on the Switch, sets port 6 as the reflector port and sets the priority of mirrored traffic to 3 in this RMirror VLAN when the Switch is the source device. This example also specifies the ports (4 and 5) on which traffic will be mirrored and shows the RMirror VLAN settings.

```
sysname# configure
sysname(config)# rmirror vlan 200
sysname(config-rmirror)# source reflector-port 6
sysname(config-rmirror)# source reflector-port
sysname(config-rmirror)# source 8021p-priority 3
sysname(config-rmirror)# source mirror-port 4,5
sysname(config-rmirror)# exit
sysname(config)# exit
sysname# show rmirror vlan 200
RMirror VLAN:200      Active=Yes
-----
Source
    802.1p priority      :3
    Mirror-port         :
        Ingress         :
        Egress          :
        Both            :4-5
    Reflector-port
        Active          :Yes
        Port            :6
Destination
    Monitor-port       :
    Connected-port     :
```

MRSTP Commands

Use these commands to configure MRSTP on the Switch.

51.1 MRSTP Overview

The Switch allows you to configure multiple instances of Rapid Spanning Tree Protocol (RSTP) as defined in the following standard.

- IEEE 802.1w Rapid Spanning Tree Protocol

See [Chapter 75 on page 281](#) for information on RSTP commands and [Chapter 52 on page 201](#) for information on MSTP commands.

51.2 Command Summary

The following section lists the commands for this feature.

Table 136 Command Summary: mrstp

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show mrstp <tree-index></code> | Displays multiple rapid spanning tree configuration for the specified tree. <i>tree-index</i> : this is a number identifying the RSTP tree configuration. Note: The number of MRSTP tree configurations supported differs by model. Refer to your User's Guide for details. | E | 3 |
| <code>spanning-tree mode <RSTP MRSTP MSTP></code> | Specifies the STP mode you want to implement on the Switch. | C | 13 |
| <code>mrstp <tree-index></code> | Activates the specified MRSTP configuration. | C | 13 |
| <code>mrstp <tree-index> priority <0-61440></code> | Sets the bridge priority of the Switch for the specified MRSTP configuration. | C | 13 |
| <code>mrstp <tree-index> hello-time <1-10> maximum-age <6-40> forward-delay <4-30></code> | Sets the Hello Time, Maximum Age and Forward Delay values on the Switch for the specified MRSTP configuration. | C | 13 |
| <code>mrstp interface <port-list></code> | Activates MRSTP on the specified ports. | C | 13 |

Table 136 Command Summary: mrstp

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| mrstp interface <port-list> edge-port | Sets the specified ports as edge ports. This allows the port to transition to a forwarding state immediately without having to go through the listening and learning states. Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Units (BPDU). | C | 13 |
| no mrstp interface <port-list> edge-port | Sets the listed ports as non-edge ports. | C | 13 |
| mrstp interface <port-list> path-cost <1-65535> | Sets a path cost to the specified ports. | C | 13 |
| mrstp interface <port-list> priority <0-255> | Sets the priority value to the specified ports for MRSTP. | C | 13 |
| mrstp interface <port-list> rootguard | Enables root guard on the specified port in order to prevent the switch(es) attached to the port from becoming the root bridge. | C | 13 |
| no mrstp interface <port-list> rootguard | Disables root guard on a port. | C | 13 |
| mrstp interface <port-list> tree-index <tree-index> | Assigns the specified port list to a specific MRSTP configuration. | C | 13 |
| no mrstp <tree-index> | Disables the specified MRSTP configuration. | C | 13 |
| no mrstp interface <port-list> | Disables the MRSTP assignment from the specified port(s). | C | 13 |

51.3 Command Examples

This example configures MRSTP in the following way:

- Enables MRSTP on the Switch.
- Activates tree **1** and sets the bridge priority, Hello Time, Maximum Age and Forward Values for this RSTP configuration.
- Activates MRSTP for ports **1-5** and sets path cost on these ports to **127**.
- Adds ports **1-5** to tree index **1**.

```

sysname(config)# spanning-tree mode mrstp
sysname(config)# mrstp 1
sysname(config)# mrstp 1 priority 16384
sysname(config)# mrstp 1 hello-time 2 maximum-age 15 forward-delay 30
sysname(config)# mrstp interface 1-5
sysname(config)# mrstp interface 1-5 path-cost 127
sysname(config)# mrstp interface 1-5 tree-index 1

```

In this example, we enable MRSTP on ports 21-24. Port 24 is connected to the host while ports 21-23 are connected to another switch.

```
sysname(config)# configure
sysname(config)# spanning-tree mode MRSTP
sysname(config)# mrstp 1
sysname(config)# mrstp interface 21-24
sysname(config)# no mrstp interface 21-23 edge-port
```


MSTP Commands

Use these commands to configure Multiple Spanning Tree Protocol (MSTP) as defined in IEEE 802.1s.

52.1 Command Summary

The following section lists the commands for this feature.

Table 137 mstp Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show mstp</code> | Displays MSTP configuration for the Switch. | E | 3 |
| <code>spanning-tree mode <RSTP MRSTP MSTP></code> | Specifies the STP mode you want to implement on the Switch. | C | 13 |
| <code>mstp</code> | Activates MSTP on the Switch. | C | 13 |
| <code>no mstp</code> | Disables MSTP on the Switch. | C | 13 |
| <code>mstp configuration-name <name></code> | Sets a name for an MSTP region. <i>name</i> : 1-32 printable characters | C | 13 |
| <code>mstp revision <0-65535></code> | Sets the revision number for this MST Region configuration. | C | 13 |
| <code>mstp hello-time <1-10> maximum-age <6-40> forward-delay <4-30></code> | Sets Hello Time, Maximum Age and Forward Delay. <i>hello-time</i> : The time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. <i>maximum-age</i> : The maximum time (in seconds) the Switch can wait without receiving a BPDU before attempting to reconfigure. <i>forward-delay</i> : The maximum time (in seconds) the Switch will wait before changing states. | C | 13 |
| <code>mstp max-hop <1-255></code> | Sets the maximum hop value before BPDUs are discarded in the MST Region. | C | 13 |
| <code>mstp interface port-channel <port-list> edge-port</code> | Sets the specified ports as edge ports. This allows the port to transition to a forwarding state immediately without having to go through the listening and learning states. Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Units (BPDU). | C | 13 |
| <code>no mstp interface port-channel <port-list> edge-port</code> | Sets the listed ports as non-edge ports. | C | 13 |

Table 137 mstp Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| mstp interface port-channel <port-list> rootguard | Enables root guard on the specified port in order to prevent the switch(es) attached to the port from becoming the root bridge. | C | 13 |
| no mstp interface port-channel <port-list> rootguard | Disables root guard on a port. | C | 13 |

Table 138 mstp instance Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| show mstp instance <number> | Displays the specified MSTP instance configuration. | E | 3 |
| no mstp instance <number> | Disables the specified MSTP instance on the Switch. | C | 13 |
| mstp instance <number> priority <0-61440> | Specifies the bridge priority of the instance. priority: Must be a multiple of 4096. | C | 13 |
| mstp instance <number> vlan <vlan-list> | Specifies the VLANs that belongs to the instance. | C | 13 |
| no mstp instance <number> vlan <1-4094> | Disables the assignment of specific VLANs from an MST instance. | C | 13 |
| mstp instance <number> interface port-channel <port-list> | Specifies the ports you want to participate in this MST instance. | C | 13 |
| no mstp instance <number> interface port-channel <port-list> | Disables the assignment of specific ports from an MST instance. | C | 13 |
| mstp instance <number> interface port-channel <port-list> path-cost <1-65535> | Specifies the cost of transmitting a frame to a LAN through the port(s). It is recommended you assign it according to the speed of the bridge. | C | 13 |
| mstp instance <number> interface port-channel <port-list> priority <0-255> | Sets the priority for the specified ports. Priority decides which port should be disabled when more than one port forms a loop in a Switch. Ports with a higher priority numeric value are disabled first. | C | 13 |

52.2 Command Examples

This example shows the current MSTP configuration.

```

sysname# show mstp
(a)BridgeMaxAge:          20          (seconds)
(b)BridgeHelloTime:      2           (seconds)
(c)BridgeForwardDelay:   15          (seconds)
(d)BridgeMaxHops:        128
(e)TransmissionLimit:    3
(f)ForceVersion:         3
(g)MST Configuration ID
  Format Selector:        0
  Configuration Name:    001349aefb7a
  Revision Number:       0
  Configuration Digest:  0xAC36177F50283CD4B83821D8AB26DE62
  msti      vlans mapped
  -----
  0         1-4094
  -----

```

The following table describes the labels in this screen.

Table 139 show mstp

| LABEL | DESCRIPTION |
|----------------------|--|
| BridgeMaxAge | This field displays the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure. |
| BridgeHelloTime | This field displays the time interval (in seconds) at which the Switch transmits a configuration message. |
| BridgeForwardDelay | This field displays the time (in seconds) the Switch will wait before changing states (that is, listening to learning to forwarding). |
| BridgeMaxHops | This field displays the number of hops (in seconds) in an MSTP region before the BPDU is discarded and the port information is aged. |
| TransmissionLimit | This field displays the maximum number of BPDUs that can be transmitted in the interval specified by BridgeHelloTime . |
| ForceVersion | This field indicates whether BPDUs are RSTP (a value less than 3) or MSTP (a value greater than or equal to 3). |
| MST Configuration ID | |
| Format Selector | This field displays zero, which indicates the use of the fields below. |
| Configuration Name | This field displays the configuration name for this MST region. |
| Revision Number | This field displays the revision number for this MST region. |
| Configuration Digest | A configuration digest is generated from the VLAN-MSTI mapping information. This field displays the 16-octet signature that is included in an MSTP BPDU. This field displays the digest when MSTP is activated on the system. |
| msti | This field displays the MSTI ID. |
| vlangs mapped | This field displays which VLANs are mapped to an MSTI. |

This example shows the current CIST configuration (MSTP instance 0).

```

sysname# show mstp instance 0
Bridge Info: MSTID: 0
  (a) BridgeID:                8000-001349aefb7a
  (b) TimeSinceTopoChange:     756003
  (c) TopoChangeCount:         0
  (d) TopoChange:              0
  (e) DesignatedRoot:         8000-001349aefb7a
  (f) RootPathCost:           0
  (g) RootPort:               0x0000
  (h) RootMaxAge:              20      (seconds)
  (i) RootHelloTime:          2        (seconds)
  (j) RootForwardDelay:       15      (seconds)
  (k) BridgeMaxAge:           20      (seconds)
  (l) BridgeHelloTime:        2        (seconds)
  (m) BridgeForwardDelay:     15      (seconds)
  (n) ForceVersion:           mstp
  (o) TransmissionLimit:      3
                                     (seconds)

  (p) CIST_RRootID:           8000-001349aefb7a
  (q) CIST_RRootPathCost:     0

```

The following table describes the labels in this screen.

Table 140 show mstp instance

| LABEL | DESCRIPTION |
|---------------------|---|
| MSTID | This field displays the MSTI ID. |
| BridgeID | This field displays the unique identifier for this bridge, consisting of bridge priority plus MAC address. |
| TimeSinceTopoChange | This field displays the time since the spanning tree was last reconfigured. |
| TopoChangeCount | This field displays the number of times the spanning tree has been reconfigured. |
| TopoChange | This field indicates whether or not the current topology is stable. 0 : The current topology is stable. 1 : The current topology is changing. |
| DesignatedRoot | This field displays the unique identifier for the root bridge, consisting of bridge priority plus MAC address. |
| RootPathCost | This field displays the path cost from the root port on this Switch to the root switch. |
| RootPort | This field displays the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree. |
| RootMaxAge | This field displays the maximum time (in seconds) the root switch can wait without receiving a configuration message before attempting to reconfigure. |
| RootHelloTime | This field displays the time interval (in seconds) at which the root switch transmits a configuration message. |
| RootForwardDelay | This field displays the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding). |
| BridgeMaxAge | This field displays the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure. |
| BridgeHelloTime | This field displays the time interval (in seconds) at which the Switch transmits a configuration message. |
| BridgeForwardDelay | This field displays the time (in seconds) the Switch will wait before changing states (that is, listening to learning to forwarding). |
| ForceVersion | This field indicates whether BPDUs are RSTP (a value less than 3) or MSTP (a value greater than or equal to 3). |
| TransmissionLimit | This field displays the maximum number of BPDUs that can be transmitted in the interval specified by BridgeHelloTime . |
| CIST_RRootID | This field displays the unique identifier for the CIST regional root bridge, consisting of bridge priority plus MAC address. |
| CIST_RRootPathCost | This field displays the path cost from the root port on this Switch to the CIST regional root switch. |

This example adds the Switch to the MST region **MSTRegionNorth**. **MSTRegionNorth** is on revision number 1. In **MSTRegionNorth**, VLAN 2 is in MST instance 1, and VLAN 3 is in MST instance 2.

```
sysname# configure
sysname(config)# mstp
sysname(config)# mstp configuration-name MSTRegionNorth
sysname(config)# mstp revision 1
sysname(config)# mstp instance 1 vlan 2
sysname(config)# mstp instance 2 vlan 3
sysname(config)# exit
```

Multiple Login Commands

Use these commands to configure multiple administrator logins on the Switch.

53.1 Command Summary

The following section lists the commands for this feature.

Table 141 multi-login Command Summary

| COMMAND | DESCRIPTION | M | P |
|------------------|---|---|----|
| show multi-login | Displays multi-login information. | E | 3 |
| multi-login | Enables multi-login. | C | 14 |
| no multi-login | Disables another administrator from logging into Telnet or SSH. | C | 14 |

53.2 Command Examples

This example shows the current administrator logins.

```

sysname# show multi-login
[session info ('*' denotes your session)]
index session      remote ip
-----
   1 telnet-d      172.16.5.15
*  2 telnet-d      172.16.5.15

```

The following table describes the labels in this screen.

Table 142 show multi-login

| LABEL | DESCRIPTION |
|-----------|---|
| index | This field displays a sequential number for this entry. If there is an asterisk (*) next to the index number, this entry is your session. |
| session | This field displays the service the administrator used to log in. |
| remote ip | This field displays the IP address of the administrator's computer. |

MVR Commands

Use these commands to configure Multicast VLAN Registration (MVR).

54.1 Command Summary

The following section lists the commands for this feature.

Table 143 mvr Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| show mvr | Shows the MVR status. | E | 3 |
| show mvr <vlan-id> | Shows the detailed MVR status and MVR group configuration for a VLAN. | E | 3 |
| mvr <vlan-id> | Enters config-mvr mode for the specified MVR (multicast VLAN registration). Creates the MVR, if necessary. | C | 13 |
| 8021p-priority <0-7> | Sets the IEEE 802.1p priority of outgoing MVR packets. | C | 13 |
| inactive | Disables these MVR settings. | C | 13 |
| no inactive | Enables these MVR settings. | C | 13 |
| mode <dynamic compatible> | Sets the MVR mode (dynamic or compatible). | C | 13 |
| name <name> | Sets the MVR name for identification purposes. <i>name</i> : 1-32 English keyboard characters | C | 13 |
| receiver-port <port-list> | Sets the receiver port(s).An MVR receiver port can only receive multicast traffic in a multicast VLAN. | C | 13 |
| no receiver-port <port-list> | Disables the receiver port(s).An MVR receiver port can only receive multicast traffic in a multicast VLAN. | C | 13 |
| source-port <port-list> | Sets the source port(s).An MVR source port can send and receive multicast traffic in a multicast VLAN. | C | 13 |
| no source-port <port-list> | Disables the source port(s).An MVR source port can send and receive multicast traffic in a multicast VLAN. | C | 13 |
| tagged <port-list> | Sets the port(s) to tag VLAN tags. | C | 13 |
| no tagged <port-list> | Sets the port(s) to untag VLAN tags. | C | 13 |
| group <name> start-address <ip> end-address <ip> | Sets the multicast group range for the MVR. <i>name</i> : 1-32 English keyboard characters | C | 13 |
| no group | Disables all MVR group settings. | C | 13 |
| no group <name-str> | Disables the specified MVR group setting. | C | 13 |
| no mvr <vlan-id> | Removes an MVR configuration of the specified VLAN from the Switch. | C | 13 |

54.2 Command Examples

This example configures MVR in the following ways:

- 1 Enters MVR mode. This creates a multicast VLAN with the name `multivlan` and the VLAN ID of 3.
- 2 Specifies source ports 2, 3, 5 for the multicast group.
- 3 Specifies receiver ports 6-8 for the multicast group.
- 4 Specifies dynamic mode for the multicast group.
- 5 Configures MVR multicast group addresses 224.0.0.1 through 224.0.0.255 by the name of `ipgroup`.
- 6 Exits MVR mode.

```
sysname(config)# mvr 3
sysname(config-mvr)# name multivlan
sysname(config-mvr)# source-port 2,3,5
sysname(config-mvr)# receiver-port 6-8
sysname(config-mvr)# mode dynamic
sysname(config-mvr)# group ipgroup start-address 224.0.0.1 end-address
--> 224.0.0.255
sysname(config-mvr)# exit
```

PART IV

Reference N-S

OSPF Commands (211)
Password Commands (217)
PoE Commands (219)
Policy Commands (223)
Policy Route Commands (227)
Port Security Commands (229)
Port-based VLAN Commands (231)
PPPoE IA Commands (232)
Private VLAN Commands (238)
Protocol-based VLAN Commands (243)
Queuing Commands (245)
RADIUS Commands (249)
Remote Management Commands (251)
RIP Commands (254)
RMON (256)
Running Configuration Commands (262)
sFlow (264)
Smart Isolation Commands (266)
SNMP Server Commands (270)
Stacking Commands (275)
STP and RSTP Commands (281)
SSH Commands (285)
Static Multicast Commands (287)

Static Route Commands (289)

Subnet-based VLAN Commands (292)

Syslog Commands (294)

OSPF Commands

This chapter explains how to use commands to configure the Open Shortest Path First (OSPF) routing protocol on the Switch.

55.1 OSPF Overview

OSPF (Open Shortest Path First) is a link-state protocol designed to distribute routing information within an autonomous system (AS). An autonomous system is a collection of networks using a common routing protocol to exchange routing information.

55.2 Command Summary

The following section lists the commands for this feature.

Table 144 OSPF Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show ip ospf database</code> | Displays OSPF link state database information. | E | 3 |
| <code>show ip ospf interface</code> | Displays OSPF interface settings. | E | 3 |
| <code>show ip ospf neighbor</code> | Displays OSPF neighbor information. | E | 3 |
| <code>show ip protocols</code> | Displays the routing protocol the Switch is using and its administrative distance value. | E | 3 |
| <code>show router ospf</code> | Displays OSPF settings. | E | 3 |
| <code>show router ospf area</code> | Displays OSPF area settings. | E | 3 |
| <code>show router ospf network</code> | Displays OSPF network (or interface) settings. | E | 3 |
| <code>show router ospf redistribute</code> | Displays OSPF redistribution settings. | E | 3 |
| <code>show router ospf virtual-link</code> | Displays OSPF virtual link settings. | E | 3 |
| <code>interface route-domain <ip-address>/<mask-bits></code> | Enters the configuration mode for this routing domain. | C | 13 |
| <code>ip ospf authentication-key <key></code> | Specifies the authentication key for OSPF. | C | 13 |
| <code>no ip ospf authentication-key <key></code> | Disables OSPF authentication in this routing domain. | C | 13 |
| <code>ip ospf authentication-same-aa</code> | Sets the same OSPF authentication settings in the routing domain as the associated area. | C | 13 |

Table 144 OSPF Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| ip ospf authentication-same-as-area | Sets the same OSPF authentication settings in the routing domain as the associated area. | C | 13 |
| no ip ospf authentication-same-aa | Sets the routing domain not to use the same OSPF authentication settings as the area. | C | 13 |
| no ip ospf authentication-same-as-area | Sets the routing domain not to use the same OSPF authentication settings as the area. | C | 13 |
| ip ospf cost <1-65535> | Sets the OSPF cost in this routing domain. | C | 13 |
| no ip ospf cost <1-65535> | Resets the OSPF cost in the routing domain to default. | C | 13 |
| ip ospf message-digest-key <key> | Sets the OSPF authentication key in this routing domain. | C | 13 |
| no ip ospf message-digest-key <key> | Disables the routing domain from using a security key in OSPF. | C | 13 |
| ip ospf priority <0-255> | Sets the OSPF priority for the interface. Setting this value to 0 means that this router will not participate in router elections. | C | 13 |
| no ip ospf priority <0-255> | Resets the OSPF priority for the interface. | C | 13 |
| router ospf <router-id> | Enables and enters the OSPF configuration mode. | C | 13 |
| area <area-id> | Enables and sets the area ID. | C | 13 |
| no area <area-id> | Removes the specified area. | C | 13 |
| area <area-id> authentication | Enables simple authentication for the area. | C | 13 |
| area <area-id> authentication message-digest | Enables MD5 authentication for the area. | C | 13 |
| no area <area-id> authentication | Sets the area to use no authentication (None). | C | 13 |
| area <area-id> default-cost <0-16777214> | Sets the cost to the area. | C | 13 |
| no area <area-id> default-cost | Sets the area to use the default cost (15). | C | 13 |
| area <area-id> name <name> | Sets a descriptive name for the area for identification purposes. | C | 13 |
| area <area-id> stub | Enables and sets the area as a stub area. | C | 13 |
| no area <area-id> stub | Disables stub network settings in the area. | C | 13 |
| area <area-id> stub no-summary | Sets the stub area not to send any LSA (Link State Advertisement). | C | 13 |
| no area <area-id> stub no-summary | Sets the area to send LSAs (Link State Advertisements). | C | 13 |
| area <area-id> virtual-link <router-id> | Sets the virtual link ID information for the area. | C | 13 |
| no area <area-id> virtual-link <router-id> | Deletes the virtual link from the area. | C | 13 |
| area <area-id> virtual-link <router-id> authentication-key <key> | Enables simple authentication and sets the authentication key for the specified virtual link in the area. | C | 13 |

Table 144 OSPF Command Summary (continued)

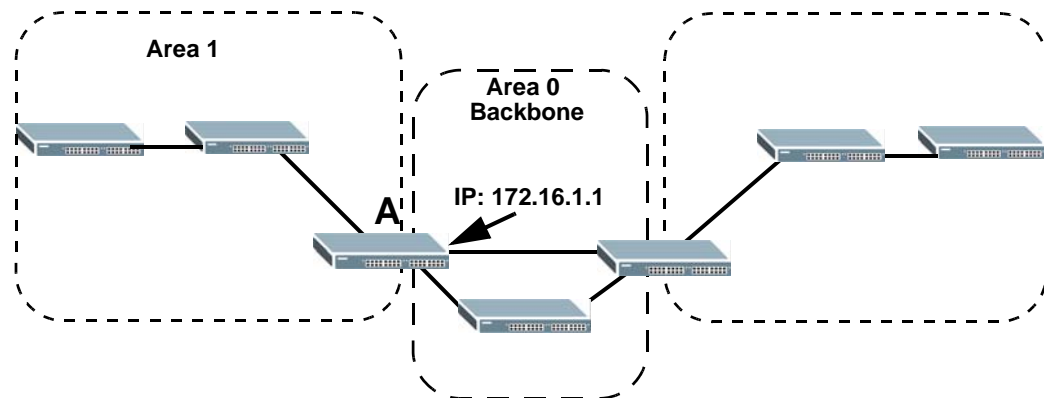
| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>no area <area-id> virtual-link <router-id> authentication-key</code> | Resets the authentication settings on this virtual link. | C | 13 |
| <code>area <area-id> virtual-link <router-ID> authentication-same-as-area</code> | Sets the virtual link to use the same authentication method as the area. | C | 13 |
| <code>no area <area-id> virtual-link <router-id> authentication-same-as-area</code> | Resets the authentication settings on this virtual area. | C | 13 |
| <code>area <area-id> virtual-link <router-id> message-digest-key <keyid> md5 <key></code> | Enables MD5 authentication and sets the key ID and key for the virtual link in the area. | C | 13 |
| <code>no area <area-id> virtual-link <router-id> message-digest-key</code> | Resets the authentication settings on this virtual link. | C | 13 |
| <code>area <area-id> virtual-link <router-id> name <name></code> | Sets a descriptive name for the virtual link for identification purposes. | C | 13 |
| <code>distance <10-255></code> | <p>When two different routing protocols, such as RIP and OSPF provide multiple routes to the same destination, the Switch can use the administrative distance of the route source to determine which routing protocol to use and add the route to the routing table.</p> <p>Sets the administrative distance (from 10 to 255) that is assigned to the routes learned by OSPF.</p> <p>The lower the administrative distance value is, the more preferable the routing protocol is. If two routes have the same administrative distance value, the Switch uses the route that has the lowest metric value.</p> <p>Note: You cannot set two routing protocols to have the same administrative distance.</p> | C | 13 |
| <code>exit</code> | Leaves the router OSPF configuration mode. | C | 13 |
| <code>network <ip-addr/bits> area <area-id></code> | Creates an OSPF area. | C | 13 |
| <code>no network <ip-addr/bits></code> | Deletes the OSPF network. | C | 13 |
| <code>redistribute rip metric-type <1 2> metric <0-16777214></code> | Sets the Switch to learn RIP routing information which will use the specified metric information. | C | 13 |
| <code>redistribute rip</code> | <p>Sets the Switch to redistribute RIP routing information.</p> <p>Route redistribution allows your Switch to import and translate external routes learned through other routing protocols (RIP and Static) into the OSPF network transparently.</p> | C | 13 |
| <code>no redistribute rip</code> | Sets the Switch not to learn RIP routing information. | C | 13 |

Table 144 OSPF Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>redistribute static metric-type <1 2> metric <0-16777214></code> | Sets the Switch to learn static routing information which will use the specified metric information. | C | 13 |
| <code>redistribute static</code> | Sets the switch to redistribute static routing information. Route redistribution allows your Switch to import and translate external routes learned through other routing protocols (RIP and Static) into the OSPF network transparently. | C | 13 |
| <code>no redistribute static</code> | Sets the Switch not to learn static routing information. | C | 13 |
| <code>passive-iface <ip-addr/bits></code> | Sets the interface to be passive. A passive interface does not send or receive OSPF traffic. | C | 13 |
| <code>no passive-iface <ip-addr/bits></code> | Sets the interface to not be passive. | C | 13 |
| <code>summary-address <ip-address> <mask></code> | Sets a summary address which is a network IP address used to cover more than one network routing entry in order to reduce the routing table size. | C | 13 |
| <code>no summary-address <ip-address> <mask></code> | Removes a summary address. | C | 13 |
| <code>show router ospf summary-address</code> | Displays all summary addresses on the Switch. | E | 3 |
| <code>no router ospf</code> | Disables OSPF on the Switch. | C | 13 |

55.3 Command Examples

In this example, the Switch (A) is an Area Border Router (ABR) in an OSPF network.

Figure 7 OSPF Network Example

This example enables OSPF on the Switch, sets the router ID to **172.16.1.1**, configures an OSPF area ID as **0.0.0.0** (backbone) and enables simple authentication.

```

sysname(config)# router ospf 172.16.1.1
sysname(config-ospf)# area 0.0.0.0
sysname(config-ospf)# area 0.0.0.0 authentication
sysname(config-ospf)# area 0.0.0.0 name backbone
sysname(config-ospf)# network 172.16.1.1/24 area 0.0.0.0
sysname# show router ospf area
  index:1      active:Y      name:backbone
  area-id:0.0.0.0      auth:SIMPLE
  stub-active:N stub-no-sum:N      default-cost:15

```

This example configures an OSPF interface for the **172.16.1.1/24** network and specifies to use simple authentication with the key **1234abcd**. The priority for the Switch is also set to **1**, as this router should participate in router elections.

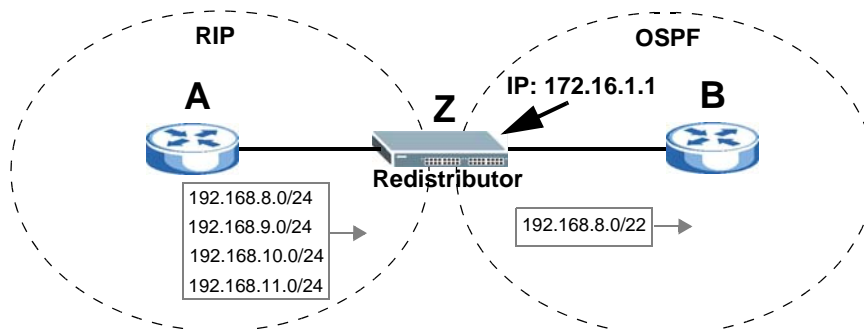
```

sysname(config)# interface route-domain 172.16.1.1/24
sysname(config-if)# ip ospf authentication-key abcd1234
sysname(config-if)# ip ospf priority 1
sysname# show ip ospf interface
swif2 is up, line protocol is up
  Internet Address 172.16.1.1/24, Area 0.0.0.0
  Router ID 172.16.1.1, Network Type BROADCAST, Cost: 15
  Transmit Delay is 1 sec, State Waiting, Priority 1
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:04
  Neighbor Count is 0, Adjacent neighbor count is 0

```

In this example, the Switch (**Z**) is a redistributor between a RIP network and an OSPF network. It summarizes 4 routing entries 192.168.8.0/24 ~ 192.168.11.0/24 (learned from RIP router **A**) into 192.168.8.0/22 and then sends it to OSPF router **B**.

Figure 8 OSPF Redistribution Summary Address Example



This example shows you how to enable the redistribution for RIP protocol and then show all redistribution entries.

```

sysname# config
sysname(config)# router ospf 172.16.1.1
sysname(config-ospf)# redistribute rip metric-type 1 metric 123
sysname(config-ospf)# exit
sysname(config)# exit
sysname# show ip ospf database

        OSPF Router with ID (172.16.1.1)

(Omit not external part °K)

                AS External Link States

Link ID          ADV Router      Age  Seq#           CkSum  Route
192.168.8.0     192.168.2.2    618 0x80000001    0x02f6  E1 192.168.8.0/24
192.168.9.0     192.168.2.2    618 0x80000001    0xf601  E1 192.168.9.0/24
192.168.10.0    192.168.2.2    618 0x80000001    0xeb0b  E1 192.168.10.0/24
192.168.11.0    192.168.2.2    618 0x80000001    0xe015  E1 192.168.11.0/24

```

From the example above, the third octet of all the four network IP addresses is 00001000, 00001001, 00001010, 00001011 respectively. The first 4 digits (000010) are the common part among these IP addresses. So 192.168.8.0/22 can be used to represent all of the 4 networks. The following example shows you how to configure the OSPF summary address and then show all redistribution entries.

```

sysname# config
sysname(config)# router ospf 172.16.1.1
sysname(config-ospf)# summary-address 192.168.8.0 255.255.252.0
sysname(config-ospf)# exit
sysname(config)# exit
sysname# show ip ospf database

        OSPF Router with ID (172.16.1.1)

(Omit not external part °K)

                AS External Link States

Link ID          ADV Router      Age  Seq#           CkSum  Route
192.168.8.0     192.168.2.2    6   0x80000001    0xf209  E1 192.168.8.0/22

```


Password Commands

Use these commands to configure passwords for specific privilege levels on the Switch.

56.1 Password Encryption

Password encryption provides service providers a means to securely enter administrator and login passwords. By default, passwords are sent in plain text. Plain text passwords are also stored temporarily in the Switch's spt and temp buffers. By enabling password encryption, you can hide these plain text passwords in transit as well as in the device buffers.

56.2 Command Summary

The following section lists the commands for this feature.

Table 145 password Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>admin-password <pw-string> <confirm-string></code> | Changes the administrator password. <i>pw-string</i> : 1-32 alphanumeric characters <i>confirm-string</i> : 1-32 alphanumeric characters | C | 14 |
| <code>admin-password [cipher] <pw-string></code> | Changes the administrator password. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the <code>password encryption</code> command. <i>pw-string</i> : 32 alphanumeric characters | C | 14 |
| <code>password [cipher] <pw-string> [privilege <0-14>]</code> | Changes the password for the highest privilege level or, optionally, the specified privilege. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the <code>password encryption</code> command. <i>password</i> : 32 alphanumeric characters | C | 14 |
| <code>no password privilege <0-14></code> | Clears the password for the specified privilege level and prevents users from entering the specified privilege level. | C | 14 |
| <code>password encryption</code> | Encrypts all passwords configured on the Switch. The encrypted secret will be preceded by the word "cipher" in the configuration file (called <code>running-config</code>)." | C | 14 |
| <code>no password encryption</code> | Disables password encryption. The encrypted password will not be changed back to plain text. | C | 14 |

56.3 Command Examples

See [Section 2.1.3.2 on page 15](#).

PoE Commands

Use these commands to configure Power over Ethernet (PoE). These are applicable for PoE models only.

57.1 Command Summary

The following section lists the commands for this feature.

Table 146 pwr Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show pwr</code> | Displays information about port power consumption and Power over Ethernet (PoE). Only available on models with the PoE feature. | E | 3 |
| <code>show poe-status</code> | This command is available for PoE models only. Displays information about Power over Ethernet (PoE) availability and usage. | E | 0 |
| <code>pwr interface <port-list></code> | Enables PoE (Power over Ethernet) on the specified port(s). | C | 13 |
| <code>pwr interface <port-list> max-power <1000-33000></code> | Sets the maximum amount of power the PD could use from the Switch on the specified port(s). | C | 13 |
| <code>no pwr interface <port-list> max-power</code> | Removes the maximum power settings for the specified port(s). The PD(s) that is connected to the port(s) then can use power up to the Switch's total power budget. | C | 13 |
| <code>pwr interface <port-list> priority <critical high low></code> | Sets the PD priority on a port to allow the Switch to allocate power to higher priority ports when the remaining power is less than the consumed power. critical > high > low Note: Available for non-full power models only. | C | 13 |
| <code>no pwr interface <port-list></code> | Disables PoE (Power over Ethernet) on the specified port(s). | C | 13 |
| <code>pwr mibtrap</code> | Enables PoE MIB traps on the Switch. Traps are initiated when the usage reaches the limit set by the <code>pwr usagethreshold</code> command. | C | 13 |
| <code>no pwr mibtrap</code> | Disables PoE MIB traps on the Switch. | C | 13 |

Table 146 pwr Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| pwr mode <classification consumption> | Set the power management mode. <ul style="list-style-type: none"> • Classification - Reserve the maximum power to each PD according to the priority level. • Consumption - Reserve the consuming power to each PD. | C | 13 |
| pwr usagethreshold <1-99> | Sets the percentage of power usage which initiates MIB traps. | C | 13 |

57.2 Command Examples

This example enables Power over Ethernet (PoE) on ports 1-4 and enables traps when the power usage reaches 25%.

```
sysname# configure
sysname(config)# pwr interface 1-4
sysname(config)# pwr usagethreshold 25
sysname(config)# pwr mibtrap
sysname(config)# exit
```

This example sets the maximum amount of power allowed for port 2 to 7500 mW.

```
sysname# configure
sysname(config)# pwr interface 2 max-power 7500
sysname(config)# exit
```

This example shows the current status and configuration of Power over Ethernet.

```

GS2200# sh pwr
PoE Mode : Classification mode
Total Power:220.0(W)
Consuming Power:0.0(W)
Allocated Power:0.0 (W)
Remaining Power:220.0(W)
Averaged Junction Temperature: 38 (c), 98 (f).
Port State    PD    Class Priority Consumption (mW) MaxPower(mW)
-----
1    Enable off    0    Low    0    0
2    Enable off    0    Low    0    7500
3    Enable off    0    Low    0    0
4    Enable off    0    Low    0    0
5    Enable off    0    Low    0    0
6    Enable off    0    Low    0    0
7    Enable off    0    Low    0    0
8    Enable off    0    Low    0    0
9    Enable off    0    Low    0    0
10   Enable off    0    Low    0    0
11   Enable off    0    Low    0    0
12   Enable off    0    Low    0    0
13   Enable off    0    Low    0    0
14   Enable off    0    Low    0    0
15   Enable off    0    Low    0    0
16   Enable off    0    Low    0    0
17   Enable off    0    Low    0    0
18   Enable off    0    Low    0    0
19   Enable off    0    Low    0    0
20   Enable off    0    Low    0    0
21   Enable off    0    Low    0    0
22   Enable off    0    Low    0    0
23   Enable off    0    Low    0    0
24   Enable off    0    Low    0    0

```

The following table describes the labels in this screen.

Table 147 show pwr

| LABEL | DESCRIPTION |
|-------------------------------|---|
| Averaged Junction Temperature | This field displays the internal temperature of the PoE chipset. |
| Port | This field displays the port number. |
| State | This field indicates whether or not PoE is enabled on this port. |
| PD | This field indicates whether or not a powered device (PD) is allowed to receive power from the Switch on this port. |
| Class | This field displays the maximum power level at the input of the PoE-enabled devices connected to this port. The range of the maximum power used by the PD is described below. 0: 0.44~12.95 W 1: 0.44~3.84 W 2: 3.84~6.49 W 3: 6.49~12.95 W |

Table 147 show pwr (continued)

| LABEL | DESCRIPTION |
|------------------|---|
| Priority | When the total power requested by the PDs exceeds the total PoE power budget on the Switch, the Switch uses the PD priority to provide power to ports with higher priority. |
| Consumption (mW) | This field displays the amount of power the Switch is currently supplying to the PoE-enabled devices connected to this port. |
| MaxPower(mW) | This field displays the maximum amount of power the Switch can supply to the PoE-enabled devices connected to this port. |
| Total Power | This field displays the total power the Switch can provide to PoE-enabled devices. |
| Consuming Power | This field displays the amount of power the Switch is currently supplying to the PoE-enabled devices. |
| Allocated Power | This field displays the total amount of power the Switch has reserved for PoE after negotiating with the PoE device(s). Note: If the management mode is set to Consumption , this field shows NA . |
| Remaining Power | This field displays the amount of power the Switch can still provide for PoE. Note: The Switch must have at least 16 W of remaining power in order to supply power to a PoE device, even if the PoE device requested less than 16 W. |

Policy Commands

Use these commands to configure policies based on the classification of traffic flows. A classifier distinguishes traffic into flows based on the configured criteria. A policy rule defines the treatment of a traffic flow.



Configure classifiers before you configure policies. See [Chapter 13 on page 53](#) for more information on classifiers.

58.1 Command Summary

The following section lists the commands for this feature.

Table 148 policy Command Summary

| COMMAND | DESCRIPTION | M | P |
|---------------------------------------|--|---|---|
| <code>show policy</code> | Displays all policy related information. | E | 3 |
| <code>show policy <name></code> | Displays the specified policy related information. | E | 3 |

Table 148 policy Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <pre>policy <name> classifier <classifier-list> <[vlan <vlan- id>] [egress-port <port- num>] [priority <0-7>] [dscp <0- 63>] [tos <0-7>] [bandwidth <bandwidth>] [egress-port <port- list>] [outgoing-packet-format <tagged untagged>] [out-of- profile-dscp <0-63>] [forward- action <drop forward egressmask>] [priority-action <[prio-set set- prio-as-inner-prio prio- replace-tos] [queue-action <prio-set prio-queue prio- replace-tos>] [diffserv-action <diff-set-tos diff-replace- priority diff-set- dscp>] [outgoing- mirror] [outgoing- eport] [outgoing-non-unicast- eport] [outgoing-set- vlan] [metering] [out-of-profile- action <[change-dscp] [drop] [forward] [set-drop- precedence]>] [inactive]></pre> | <p>Configures a policy with the specified name. <i>name</i>: 32 alphanumeric characters</p> <p>Specifies which classifiers this policy applies to. <i>classifier-list</i>: names of classifiers separated by commas.</p> <p>Specifies the parameters related to the actions: <i>egress-port</i>: an outbound port number <i>priority</i>: IEEE 802.1p priority field <i>bandwidth</i>: bandwidth limit in Kbps, actions can be assigned to packets which exceed the bandwidth limit (out-of-profile). <i>out-of-profile-dscp</i>: sets a DSCP number, if you want to replace or remark the DSCP number for out-of-profile traffic.</p> <p>Specifies the actions for this policy:</p> <ul style="list-style-type: none"> <i>priority-action</i>: tells the Switch to: <ul style="list-style-type: none"> replace the packet's IEEE 802.1p priority field with the priority you specified in the <i>priority</i> parameter (<i>prio-set</i>) replace the packet's IEEE 802.1p priority field with the existing customer priority level carried in the frames (<i>set-prio-as-inner-prio</i>) replace the IEEE 802.1p priority field with the tos parameter value (<i>prio-replace-tos</i>). <i>queue-action</i>: tells the Switch to: <ul style="list-style-type: none"> set the IEEE 802.1p priority you specified in the <i>priority</i> parameter (<i>prio-set</i>) sends the packet to priority queue (<i>prio-queue</i>) replace the IEEE 802.1p priority field with the tos parameter value (<i>prio-replace-tos</i>). <i>diffserv-action</i> - chooses whether you want to set the ToS field with the value you specified for the <i>tos</i> parameter (<i>diff-set-tos</i>), replaces the IP ToS with IEEE 802.1p priority value (<i>diff-replace-priority</i>) or sets the DSCP field with the <i>dscp</i> parameter value (<i>diff-set-dscp</i>) <i>outgoing-mirror</i> - sends the packet to the mirror port. <i>outgoing-eport</i> - sends the packet to the egress port. <i>outgoing-non-unicast-eport</i> - sends the broadcast, dlf or multicast packets (marked for dropping or to be sent to the CPU) to the egress port. <i>metering</i> - enables bandwidth limitations on the traffic flows. <i>out-of-profile-action</i> - specifies the actions to take for packets that exceed the bandwidth limitations: <ul style="list-style-type: none"> replaces the DSCP field with the value in the <i>out-of-profile-dscp</i> parameter (<i>change-dscp</i>). discards the out of profile packets (<i>drop</i>). queues the packets that are marked for dropping (<i>forward</i>). marks the out of profile traffic and drops it when network is congested (<i>set-drop-precedence</i>). <i>inactive</i> - disables the policy rule. | C | 13 |

Table 148 policy Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| policy <name> classifier <classifier-list> <[vlan <vlan-id>] [egress-port <port-num>] [priority <0-7>] [bandwidth <bandwidth>] [forward-action <drop>] [queue-action <prio- set>] [outgoing-eport] [outgoing-set-vlan] [rate-limit] [inactive]> | Configures a policy with the specified name. <i>name</i> : 32 alphanumeric characters | C | 13 |
| | Specifies which classifiers this policy applies to. <i>classifier-list</i> : names of classifiers separated by commas. | | |
| | Specifies the parameters related to the actions: <i>vlan</i> : a VLAN ID number <i>egress-port</i> : an outbound port number <i>priority</i> : IEEE 802.1p priority field <i>bandwidth</i> : bandwidth limit in Kbps, packets which exceed the bandwidth limit are dropped. | | |
| | Specifies the actions for this policy: <ul style="list-style-type: none"> • <i>queue-action</i>: tells the Switch to: <ul style="list-style-type: none"> - set the IEEE 802.1p priority you specified in the priority parameter (<i>prio-set</i>) • <i>outgoing-eport</i> - sends the packet to the egress port. • <i>outgoing-set-vlan</i> - replaces the VLAN ID of the packets with the one you configured. • <i>rate-limit</i> - enables bandwidth limitations on the traffic flows. <i>inactive</i> - disables the policy rule. | | |
| no policy <name> | Deletes the policy. | C | 13 |
| no policy <name> inactive | Enables a policy. | C | 13 |

58.2 Command Examples

This example creates a policy (**highPriority**) for the traffic flow identified via classifier **VLAN3** (see the classifier example in [Chapter 13 on page 53](#)). This policy replaces the IEEE 802.1 priority field with the IP ToS priority field (value **7**) for **VLAN3** packets.

```

sysname(config)# policy highPriority classifier VLAN3 tos 7 queue-action
prio-replace-tos
sysname(config)# exit
sysname# show policy highPriority
Policy highPriority:
  Classifiers:
    VLAN3;
  Parameters:
    VLAN = 1; Priority = 0; DSCP = 0; TOS = 7;
    Egress Port = 1; Outgoing packet format = tagged;
    Bandwidth = 0; Out-of-profile DSCP = 0;
  Action:
    Replace the 802.1 priority field with the IP TOS value;

```

This example creates a policy (**Policy1**) for the traffic flow identified via classifier **Class1** (see the classifier example in [Chapter 13 on page 53](#)). This policy forwards **Class1** packets to port 8.

```
sysname(config)# policy Policy1 classifier Class1 egress-port 8 outgoing-
eport
sysname(config)# exit
sysname# show policy Policy1
Policy Policy1:
  Classifiers:
    Class1;
  Parameters:
    VLAN = 1; Priority = 0;
    Egress Port = 8;
    Bandwidth = 64;
  Action:
    Send the packet to the egress port;
sysname#
```

Policy Route Commands

Use these commands to configure policy route to override the default routing behavior and alter the packet forwarding. Policy-based routing is based on the classification of traffic flows and applied to incoming packets prior to the normal routing. A classifier distinguishes traffic into flows based on the configured criteria.



Configure layer-3 classifiers before you configure policy routing. See [Chapter 13 on page 53](#) for more information on classifiers.

59.1 Command Summary

The following section lists the commands for this feature.

Table 149 policy-route Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show ip policy-route</code> | Displays all policy routing profile settings. | E | 3 |
| <code>show ip policy-route <name></code> | Displays the specified policy routing profile settings. <i>name</i> : 32 alphanumeric characters | E | 3 |
| <code>show ip policy-route <name> sequence <number></code> | Displays settings for the specified policy routing rule in a profile. <i>sequence</i> : sets the rule number from 1 to 64. The ordering of policy routing rules is important as rules are applied in turn. | E | 3 |
| <code>ip policy-route <name></code> | Sets a a policy routing profile with the specified name. You must configure a profile before you can configure a rule. | C | 13 |
| <code>ip policy-route <name> inactive</code> | Disables a policy routing profile. | C | 13 |
| <code>ip policy-route <name> sequence <number> <permit deny> classifier <classifier> next-hop <ip-addr></code> | Configures a policy routing rule in the specified profile. <i>permit deny</i> : turns on or off this policy routing rule. <i>classifier</i> : sets the name of active layer 3 classifier to which this rule applies. <i>next-hop</i> : sets the IP address of the gateway to which the Switch forwards the matched traffic. | C | 13 |
| <code>no ip policy-route <name></code> | Deletes the specified policy routing profile. | C | 13 |
| <code>no ip policy-route <name> inactive</code> | Enables a policy routing profile. | C | 13 |
| <code>no ip policy-route <name> sequence <number></code> | Deletes a rule from the specified policy routing profile. | C | 13 |

59.2 Command Examples

By default, the Switch forwards all packets to the default gateway. This example configures a layer 3 classifier (**Class-1**) to group traffic with source IP address 192.168.2.13. This example also creates a policy routing rule in profile **Profile-1** to set the Switch to forward packets that match the layer 3 classifier to the gateway with IP address 10.1.1.99. It then shows the policy routing information.

```
sysname# configure
sysname(config)# classifier Class-1 source-ip 192.168.2.13 mask-bits 24
sysname(config)# ip policy-route Profile-1 sequence 5 permit classifier
Class-1 next-hop 10.1.1.99
sysname(config)# exit
sysname# show ip policy-route
ActiveProfile Name                               Sequence  State   Classifier
-----
Yes   Profile-1                                   5         permit  Class-1

sysname# show ip policy-route Profile-1 sequence 5
Policy route profile: Profile-1 Yes
Information: permit 5
Classifier: Class-1
Action:
  Next hop: 10.1.1.99
Matched policy route: 19074 packets
sysname#
```

Port Security Commands

Use these commands to allow only packets with dynamically learned MAC addresses and/or configured static MAC addresses to pass through a port on the Switch. For maximum port security, enable port security, disable MAC address learning and configure static MAC address(es) for a port.



It is not recommended you disable both port security and MAC address learning because this will result in many broadcasts.

60.1 Command Summary

The following section lists the commands for this feature.

Table 150 port-security Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show port-security</code> | Displays all port security settings. | E | 3 |
| <code>show port-security <port-list></code> | Displays port security settings on the specified port(s). | E | 3 |
| <code>port-security</code> | Enables port security on the Switch. | C | 13 |
| <code>no port-security</code> | Disables port security on the device. | C | 13 |
| <code>port-security <port-list></code> | Enables port security on the specified port(s). | C | 13 |
| <code>no port-security <port-list></code> | Disables port security on the specified port(s). | C | 13 |
| <code>port-security <port-list> learn inactive</code> | Disables MAC address learning on the specified port(s). | C | 13 |
| <code>no port-security <port-list> learn inactive</code> | Enables MAC address learning on the specified ports. | C | 13 |
| <code>port-security <port-list> address-limit <number></code> | Limits the number of (dynamic) MAC addresses that may be learned on the specified port(s). | C | 13 |
| <code>port-security <port-list> MAC-freeze</code> | Stops MAC address learning and enables port security on the port(s). Note: All previously-learned dynamic MAC addresses are saved to the static MAC address table. | C | 13 |
| <code>port-security <port-list> vlan <vlan-id> address-limit <number></code> | Limits the number of (dynamic) MAC addresses that may be learned on the specified port(s) in a specified VLAN. | C | 13 |

Table 150 port-security Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| no port-security <port-list> vlan <vlan-id> address-limit | Removes the specified VLAN MAC address limit. | C | 13 |
| port-security <port-list> vlan <vlan-id> address-limit <number> inactive | Disables the specified VLAN MAC address limit. | C | 13 |
| no port-security <port-list> vlan <vlan-id> address-limit inactive | Enables the specified VLAN MAC address limit. | C | 13 |

60.2 Command Examples

This example enables port security on port 1 and limits the number of learned MAC addresses to 5.

```

sysname# configure
sysname(config)# port-security
sysname(config)# port-security 1
sysname(config)# no port-security 1 learn inactive
sysname(config)# port-security 1 address-limit 5
sysname(config)# exit
sysname# show port-security 1
  Port Security Active : YES
  Port   Active   Address Learning   Limited Number of Learned MAC Address
  01     Y         Y                   5

```

Port-based VLAN Commands

Use these commands to configure port-based VLAN.



These commands have no effect unless port-based VLAN is enabled.

61.1 Command Summary

The following section lists the commands for this feature.

Table 151 egress Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show interfaces config <port-list> egress</code> | Displays outgoing port information. | E | 3 |
| <code>vlan-type <802.1q port-based></code> | Specifies the VLAN type. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>egress set <port-list></code> | Sets the outgoing traffic port list for a port-based VLAN. | C | 13 |
| <code>no egress set <port-list></code> | Removes the specified ports from the outgoing traffic port list. | C | 13 |

61.2 Command Examples

This example looks at the ports to which incoming traffic from ports 1 and 2 can be forwarded.

```
sysname# show interfaces config 1-2 egress
Port 1: Enabled egress ports cpu, eg1
Port 2: Enabled egress ports cpu, eg1-eg4
```

PPPoE IA Commands

Use these commands if you want the Switch to add a vendor-specific tag to PADI (PPPoE Active Discovery Initiation) and PADR (PPPoE Active Discovery Request) packets from PPPoE clients. This tag gives a PPPoE termination server additional information (such as the port number, VLAN ID, and MAC address) that the server can use to identify and authenticate a PPPoE client.

62.1 PPPoE Intermediate Agent Overview

A PPPoE Intermediate Agent (PPPoE IA) is deployed between a PPPoE server and PPPoE clients. It helps the PPPoE server identify and authenticate clients by adding subscriber line specific information to PPPoE discovery packets from clients on a per-port or per-port-per-VLAN basis before forwarding them to the PPPoE server.

62.1.1 Port State

Every port is either a trusted port or an untrusted port for the PPPoE intermediate agent. This setting is independent of the trusted/untrusted setting for DHCP snooping or ARP inspection. You can also specify the agent sub-options (circuit ID and remote ID) that the Switch adds to PADI and PADR packets from PPPoE clients.

Trusted ports are connected to PPPoE servers.

- If a PADO (PPPoE Active Discovery Offer), PADS (PPPoE Active Discovery Session-confirmation), or PADT (PPPoE Active Discovery Terminate) packet is sent from a PPPoE server and received on a trusted port, the Switch forwards it to all other ports.
- If a PADI or PADR packet is sent from a PPPoE client but received on a trusted port, the Switch forwards it to other trusted port(s).



The Switch will drop all PPPoE discovery packets if you enable the PPPoE intermediate agent and there are no trusted ports.

Untrusted ports are connected to subscribers.

- If a PADI, PADR, or PADT packet is sent from a PPPoE client and received on an untrusted port, the Switch adds a vendor-specific tag to the packet and then forwards it to the trusted port(s).

- The Switch discards PADO and PADS packets which are sent from a PPPoE server but received on an untrusted port.

62.2 Command Summary

The following section lists the commands for this feature.

Table 152 PPPoE Intermediate Agent Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>clear pppoe intermediate-agent statistics</code> | Removes all statistics records of PPPoE packets on the Switch. | E | 13 |
| <code>clear pppoe intermediate-agent statistics vlan <vlan-list></code> | Removes statistics records of PPPoE packets for the specified VLAN(s). | E | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>pppoe intermediate-agent trust</code> | Sets the specified port(s) as PPPoE IA trusted port(s). | C | 13 |
| <code>pppoe intermediate-agent format-type circuit-id string <string></code> | Specifies a string the Switch adds into the Agent Circuit ID sub-option for PPPoE discovery packets received on this port. Spaces are allowed. <i>string</i> : up to 63 ASCII characters | C | 13 |
| <code>pppoe intermediate-agent format-type remote-id string <string></code> | Specifies a string the Switch adds into the Agent Remote ID sub-option for PPPoE discovery packets received on this port. Spaces are allowed. <i>string</i> : up to 63 ASCII characters | C | 13 |
| <code>pppoe intermediate-agent vlan <vlan-id> format-type circuit-id string <string></code> | Specifies a string the Switch adds into the Agent Circuit ID sub-option for PPPoE discovery packets received on this VLAN on the specified port. Spaces are allowed. The Circuit ID you configure for a specific VLAN on a port has the highest priority. | C | 13 |
| <code>pppoe intermediate-agent vlan <vlan-id> format-type remote-id string <string></code> | Specifies a string the Switch adds into the Agent Remote ID sub-option for PPPoE discovery packets received on this VLAN on the specified port. Spaces are allowed. The Remote ID you configure for a specific VLAN on a port has the highest priority. | C | 13 |
| <code>no pppoe intermediate-agent trust</code> | Sets the specified port(s) PPPoE IA untrusted port(s). | C | 13 |
| <code>no pppoe intermediate-agent format-type circuit-id</code> | Disables the PPPoE IA Circuit ID settings for the specified port(s). | C | 13 |
| <code>no pppoe intermediate-agent format-type remote-id</code> | Disables the PPPoE IA Remote ID settings for the specified port(s). | C | 13 |
| <code>no pppoe intermediate-agent vlan <vlan-id> format-type circuit-id</code> | Disables the PPPoE IA Circuit ID settings for the specified port(s) on the specified VLAN(s). | C | 13 |
| <code>no pppoe intermediate-agent vlan <vlan-id> format-type remote-id</code> | Disables the PPPoE IA Remote ID settings for the specified port(s) on the specified VLAN(s). | C | 13 |
| <code>no pppoe intermediate-agent</code> | Disables PPPoE IA globally. | C | 13 |
| <code>no pppoe intermediate-agent vlan <vlan-list> remote-id</code> | Disables the PPPoE IA Remote ID settings for the specified VLAN(s). | C | 13 |

Table 152 PPPoE Intermediate Agent Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---------|----|
| no pppoe intermediate-agent format-type access-node-identifier | Removes the access-node-identifier you have set. | C | 13 |
| no pppoe intermediate-agent format-type identifier-string | Removes the identifier-string you have set. | C | 13 |
| no pppoe intermediate-agent format-type identifier-string hostname | Sets the Switch to not add the Switch's host name to the identifier-string. | C | 13 |
| no pppoe intermediate-agent vlan <vlan-list> | Disables PPPoE IA for the specified VLAN(s). | C | 13 |
| no pppoe intermediate-agent vlan <vlan-list> circuit-id | Disables the PPPoE IA Circuit ID settings for the specified VLAN(s). | C | 13 |
| pppoe intermediate-agent | Enables PPPoE Intermediate Agent (PPPoE IA) globally. | C | 13 |
| pppoe intermediate-agent format-type identifier-string hostname | Sets the Switch to add the Switch's host name to the identifier-string. | C | 13 |
| pppoe intermediate-agent format-type access-node-identifier string <string> | Sets the access-node-identifier string. <i>string</i> : Enter up to 20 alphanumeric characters to identify the PPPoE intermediate agent. Hyphens (-) and spaces are also allowed. The default is the Switch's host name. | C VV | 13 |
| pppoe intermediate-agent format-type identifier-string string <string> option <s p v sp sv pv spv> delimiter <# . , ; / > | This command sets the following: <ul style="list-style-type: none"> a string that the Switch adds in the Agent Circuit ID sub-option the variables to generate and add in the Agent Circuit ID sub-option, a delimiter to separate the identifier-string, slot ID, port number and/or VLAN ID from each other. <i>string</i> : You can up to 63 printable characters. Spaces are allowed. option <s p v sp sv pv spv>: s, p and v indicate slot, port, vlan, and sp, sv, pv and spv indicate combinations of slot-port, slot-VLAN, port-VLAN and slot-port-VLAN respectively. The Switch enters a zero into the PADI and PADR packets for the slot value. delimiter <# . , ; / >: You can use a pound key (#), semi-colon (;), period (.), comma (,), forward slash (/) or a space. | C | 13 |
| pppoe intermediate-agent vlan <vlan-list> | Enables PPPoE IA for the specified VLAN(s). | C | 13 |
| pppoe intermediate-agent vlan <vlan-list> circuit-id | Enables the PPPoE IA Circuit ID settings for the specified VLAN(s). | C | 13 |
| pppoe intermediate-agent vlan <vlan-list> remote-id | Enables the PPPoE IA Remote ID settings for the specified VLAN(s). | C | 13 |
| show pppoe intermediate-agent | Shows the PPPoE IA settings. | E | 13 |
| show pppoe intermediate-agent statistic | Shows the statistics of PPPoE packets handled (received, forwarded and dropped) by PPPoE IA on the Switch. | E | 13 |
| show pppoe intermediate-agent statistic vlan <vlan-list> | Shows the statistics of PPPoE packets for the specified VLAN(s). | E | 13 |

62.3 Command Examples

This is an example of how to enable and disable PPPoE IA on the Switch.

```
sysname# configure
sysname(config)# pppoe intermediate-agent
sysname(config)# no pppoe intermediate-agent
```

This is an example of how to enable and configure PPPoE IA for VLANs.

```
sysname# configure
sysname(config)# pppoe intermediate-agent vlan 2
sysname(config)# pppoe intermediate-agent vlan 5,9,11
sysname(config)# pppoe intermediate-agent vlan 1 circuit-id
sysname(config)# pppoe intermediate-agent vlan 3,6 remote-id
sysname(config)# no pppoe intermediate-agent vlan 2-10
sysname(config)# no pppoe intermediate-agent vlan 1 circuit-id
sysname(config)# no pppoe intermediate-agent vlan 3,6 remote-id
```

This is an example of how to set a PPPoE IA trust port.

```
sysname# configure
sysname(config)# interface port-channel 3
sysname(config-interface)# pppoe intermediate-agent trust
sysname(config-interface)# no pppoe intermediate-agent trust
```

This example is more advanced. It assumes a PPPoE IA client is connected to port 2 and a PPPoE IA server is connected to port 5. If we want PPPoE IA to work, port 2 and port 5 must be belong to the some VLAN and the PPPoE IA must be enabled globally and in this corresponding VLAN. We also need to set port 5 as trust port. Then the last thing we need to do is to decide which sub-options the received PADI, PADR, or PADT packet needs to carry. Here, assume both circuit-id and remote-id should be carried.

```
sysname# configure
sysname(config)# vlan 2
sysname(config-vlan)# fixed 2,5
sysname(config-vlan)# untagged 2,5
sysname(config-vlan)# exit
sysname(config)# pppoe intermediate-agent
sysname(config)# pppoe intermediate-agent vlan 2
sysname(config)# interface port-channel 2
sysname(config-interface)# pvid 2
sysname(config-interface)#exit
sysname(config)# interface port-channel 5
sysname(config-interface)# pvid 2
sysname(config-interface)# pppoe intermediate-agent trust
sysname(config-interface)#exit
sysname(config)# pppoe intermediate-agent vlan 2 circuit-id
sysname(config)# pppoe intermediate-agent vlan 2 remote-id
```

62.3.1 Vendor-Specific Tag Examples

The following examples show you how to configure the vendor-specific tag for PPPoE IA. They assume there is a PPPoE IA client connected to port 2 and PPPoE IA server (or up-link port) connected to port 5.

```

sysname# configure
sysname(config)# pppoe intermediate-agent
sysname(config)# pppoe intermediate-agent format-type access-node-
identifier string test
sysname(config)# pppoe intermediate-agent vlan 1
sysname(config)# pppoe intermediate-agent vlan 1 circuit-id
sysname(config)# pppoe intermediate-agent vlan 1 remote-id
sysname(config)# interface port-channel 5
sysname(config-interface)# pppoe intermediate-agent trust
sysname(config-interface)#exit

```

This is a variation of the previous one and uses the same initial setup (client on port 2, server on port 5).

```

sysname# configure
sysname(config)# pppoe intermediate-agent
sysname(config)# pppoe intermediate-agent format-type identifier-string
string PrivateTest option spv delimiter /
sysname(config)# pppoe intermediate-agent vlan 1
sysname(config)# pppoe intermediate-agent vlan 1 circuit-id
sysname(config)# pppoe intermediate-agent vlan 1 remote-id
sysname(config)# interface port-channel 5
sysname(config-interface)# pppoe intermediate-agent trust
sysname(config-interface)#exit

```

Because we didn't assign the appended string for remote-id in examples 1 and 2, the Switch appends a string to carry the client's MAC address as default. If we want the remote-id to carry the "ForPortVlanRemoteIdTest" information for a specific VLAN on a port, we can add the following configuration:

```

sysname# configure
sysname(config)# interface port-channel 2
sysname(config-interface)# pppoe intermediate-agent vlan 1 format-type
remote-id string ForPortVlanRemoteIdTest
sysname(config-interface)# exit

```

Similarly, we can let the circuit-id carry the information which we configure:

```

sysname# configure
sysname(config)# interface port-channel 2
sysname(config-interface)# pppoe intermediate-agent vlan 1 format-type
circuit-id string ForPortVlanCircuitIdTest
sysname(config-interface)# exit

```

Additionally, we can let the circuit-id or remote-id carry the user-configured information from a specific port whose priority is less than the specific VLAN on a port setting:

```
sysname# configure
sysname(config)# interface port-channel 2
sysname(config-interface)# pppoe intermediate-agent format-type circuit-
id string ForPortCircuitIdTest
sysname(config-interface)# pppoe intermediate-agent format-type remote-
id string ForPortRemoteIdTest
sysname(config-interface)# exit
```

Since we didn't assign the appended string for remote-id in example 1 and 2, it will carry the client's MAC address as default.

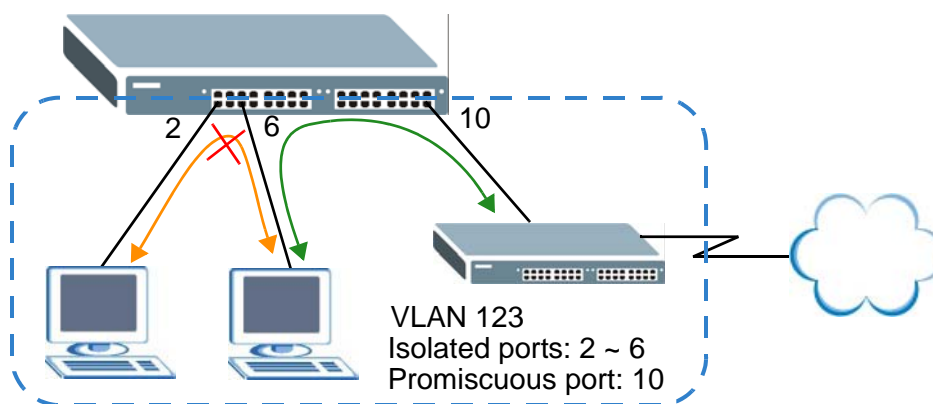
Private VLAN Commands

This chapter explains how to use commands to configure (legacy) Private VLANs (PVLAN) on the Switch.

63.1 Legacy PVLAN Overview

Private VLAN allows you to do port isolation within a VLAN in a simple way. In private VLAN, a promiscuous port can communicate with any port in the same VLAN. While an isolated port can communicate with the promiscuous port(s) only.

Figure 9 Private VLAN Example



If you change the VLAN settings, make sure you keep at least one port in the promiscuous port list for a VLAN with private VLAN enabled. Otherwise, this VLAN is blocked from the whole network.

63.1.1 Legacy PVLAN Command Summary

The following section lists the commands for this feature.

Table 153 private-vlan (legacy) Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| no private-vlan <vlan-id> | Removes the specified private VLAN rule. | C | 13 |
| no private-vlan <vlan-id> inactive | Enables the specified private VLAN rule. | C | 13 |
| private-vlan name <name> vlan <vlan-id> promiscuous-port <port-list> | Sets a private VLAN rule. You specify which port(s) in a VLAN is not isolated by adding it to the promiscuous port list. The Switch automatically adds other ports in this VLAN to the isolated port list and block traffic between the isolated ports. Enter a name, VLAN ID and the promiscuous ports. You can enter individual ports separated by a comma or a range of ports by using a dash. For example, 1,3,5-8 indicates ports 1 and 3 and ports 5 through 8 are the promiscuous ports. | C | 13 |
| private-vlan name <name> vlan <vlan-id> promiscuous-port <port-list> inactive | Disables a private VLAN rule. | C | 13 |
| private-vlan name <name> vlan <vlan-id> | Sets a private VLAN rule for the specified VLAN. The Switch automatically adds all ports (except the uplink port(s)) in this VLAN to the isolated port list and blocks traffic between the isolated ports. The uplink ports in the VLAN are always in the promiscuous port list. | C | 13 |
| private-vlan name <name> vlan <vlan-id> inactive | Disables a private VLAN rule. | C | 13 |
| show private-vlan | Displays the settings and status of all private VLAN rules on the Switch. | E | 3 |
| show private-vlan <vlan-id> | Displays the settings and status of the specified private VLAN rule on the Switch. | E | 3 |

63.1.2 Command Examples

This example sets a private VLAN rule (pvlan-123) that applies to VLAN 123. Ports 7 and 8 are the promiscuous ports in VLAN 123. Other ports in this VLAN are added to the isolated port list automatically and cannot communicate with each other. The isolated ports in VLAN 123 can send and receive traffic from ports 7 and 8. This example also shows all private VLAN rules configured on the Switch.

```

sysname# configure
sysname(config)# private-vlan name pvlan-123 vlan 123 promiscuous-port 7-8
sysname(config)# exit
sysname# show private-vlan
  Private VLAN: 123      Active: Yes
  Name      Promiscuous Port
  -----
  pvlan-123  7-8
sysname#

```

This example sets a private VLAN rule (`pvlan-111`) that applies to VLAN 111. Ports 1, 2 and 24 belong to VLAN 111. Ports 1 and 2 are added to the isolated port list automatically and cannot communicate with each other. Port 24 is the uplink port and also the promiscuous port in this VLAN. The isolated ports in VLAN 111 can send and receive traffic from the uplink port 24. This example also shows all private VLAN rules configured on the Switch.

```

sysname# configure
sysname(config)# private-vlan name pvlan-111 vlan 111
sysname(config)# exit
sysname# show private-vlan
  Private VLAN: 111    Active: Yes
  Name      Promiscuous Port
  -----
  pvlan-111  24
sysname#

```

63.2 Private VLAN

Use Private VLAN if you want you to block traffic between ports in the same VLAN. Community and Isolated VLANs are secondary private VLANs that must be associated with a Primary private VLAN.

- **Primary:** Ports in a Primary VLAN are promiscuous and they can communicate with all promiscuous ports in the same primary VLAN, and all ports in associated community and isolated VLANs. They cannot communicate with ports in different primary VLANs.
- **Community:** Ports in a Community VLAN can communicate with promiscuous ports in an associated Primary VLAN and other community ports in the same Community VLAN. They cannot communicate with ports in Isolated VLANs, non-associated Primary VLAN promiscuous ports nor community ports in different Community VLANs.
- **Isolated:** Ports in an Isolated VLAN can communicate with promiscuous ports in an associated Primary VLAN only. They cannot communicate with other isolated ports in the same Isolated VLAN, non-associated Primary VLAN promiscuous ports nor any community ports.

Tagged private VLANs can span switches but trunking ports must be VLAN-trunking ports.

63.2.1 Command Summary

The following section lists the commands for this feature.

Table 154 private-vlan Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>vlan <vlan-id></code> | Enters config-vlan mode for the specified VLAN. Creates the VLAN, if necessary. | C | 13 |
| <code>private-vlan <primary isolated community></code> | Configures the specified VLAN as a Primary VLAN, Isolated VLAN or a Community VLAN. | C | 13 |

Table 154 private-vlan Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| private-vlan association <secondary-vlan-list> | Primary private VLANs can associate with several (secondary) Community private VLANs and up to one (secondary) Isolated private VLAN. Specify a primary private VLAN, then associate it with a secondary VLAN(s) using this command. | C | 13 |
| no private-vlan <primary isolated community> | Disables the VLAN as a Primary, Isolated or Community VLAN. | C | 13 |
| no private-vlan association | Removes all association between the primary VLAN and secondary VLANs. | C | 13 |
| no private-vlan association <secondary-vlan-list> | Removes association between the primary VLAN and the specified secondary VLAN(s). | C | 13 |
| interface port-channel <port- list> | Enters config-interface mode for the specified port(s). | C | 13 |
| private-vlan mode <promiscuous isolated community> association <vlan-id> dot1q <tagged untagged> | Configures PVLAN on a port. Set the associated PVLAN ID, type of private VLAN and specify whether outgoing frames from this port are tagged or not. | C | 13 |
| no private-vlan mode | Removes PVLAN mode configuration. | C | 13 |
| show vlan private-vlan | Displays the settings and status of all private VLAN rules on the Switch. | E | 3 |
| show vlan private-vlan <vlan-id> | Displays the settings and status of the specified private VLAN rule on the Switch. | E | 3 |

63.2.2 Command Example

This example sets private VLAN 100 as a primary private VLAN, private VLAN 101 as a community private VLAN and private VLAN 102 as an isolated private VLAN. VLANs 101 and 102 are secondary private VLANs that are associated primary private VLAN 101. Use the specified show command to display all private VLAN configurations on the switch.

Primary PVLAN 100 is then mapped to port 2 on the Switch and outgoing frames from port 2 will be tagged.

```
sysname# configure
sysname(config)# vlan 100
sysname(config-vlan)# private-vlan primary
sysname(config-vlan)# exit
sysname(config)# vlan 101
sysname(config-vlan)# private-vlan community
sysname(config-vlan)# exit
sysname(config)# vlan 102
sysname(config-vlan)# private-vlan isolated
sysname(config-vlan)# exit
sysname(config)# vlan 100
sysname(config-vlan)# private-vlan association 101,102
sysname(config-vlan)# exit
sysname(config)# exit
sysname# show vlan private-vlan
  Private Vlan:
  Primary  Secondary      Type          Ports
  -----  -
           100           Primary
           100      102     Isolated
           100      101     Community
sysname#
sysname# configure
sysname(config)# interface port-channel 2
sysname(config-interface)# private-vlan mode promiscuous association 100-->
dot1q tagged
sysname(config-interface)#exit
sysname(config)#
```

Protocol-based VLAN Commands

Use these commands to configure protocol based VLANs on the Switch.

64.1 Protocol-based VLAN Overview

Protocol-based VLANs allow you to group traffic based on the Ethernet protocol you specify. This allows you to assign priority to traffic of the same protocol.

See also [Chapter 79 on page 292](#) for subnet-based VLAN commands and [Chapter 88 on page 312](#) for VLAN commands.

64.2 Command Summary

The following section lists the commands for this feature.

Table 155 protocol-based-vlan Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>show interfaces config <port-list> protocol-based-vlan</code> | Displays the protocol based VLAN settings for the specified port(s). | E | 3 |
| <code>interface port-channel <port-list></code> | Enters subcommand mode for configuring the specified ports. | C | 13 |

Table 155 protocol-based-vlan Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <pre>protocol-based-vlan name <name> ethernet-type <ether- num ip ipx arp rarp appleta lk decnet> vlan <vlan-id> priority <0-7></pre> | <p>Creates a protocol based VLAN with the specified parameters.</p> <p><i>name</i> - Use up to 32 alphanumeric characters.</p> <p><i>ether-num</i> - if you don't select a predefined Ethernet protocol (ip, ipx, arp, rarp, appletalk or decnet), type the protocol number in hexadecimal notation with a prefix, "0x". For example, type 0x0800 for the IP protocol and type 0x8137 for the Novell IPX protocol.</p> <p>Note: Protocols in the hexadecimal number range 0x0000 to 0x05ff are not allowed.</p> <p><i>priority</i> - specify the IEEE 802.1p priority that the Switch assigns to frames belonging to this VLAN.</p> | C | 13 |
| <pre>no protocol-based-vlan ethernet-type <ether- num ip ipx arp rarp appleta lk decnet></pre> | <p>Disables protocol based VLAN of the specified protocol on the port.</p> | C | 13 |

64.3 Command Examples

This example creates an IP based VLAN called IP_VLAN on ports 1-4 with a VLAN ID of 200 and a priority 6.

```
sysname(config)# interface port-channel 1-4
sysname(config-interface)# protocol-based-vlan name IP_VLAN ethernet-type ip
--> vlan 200 priority 6
sysname(config-interface)# exit
sysname(config)# exit
sysname# show interfaces config 1-4 protocol-based-vlan
  Name  Port  Packet type  Ethernet type  Vlan  Priority  Active
-----
IP_VLAN  1      EtherII           ip    200      6      Yes
IP_VLAN  2      EtherII           ip    200      6      Yes
IP_VLAN  3      EtherII           ip    200      6      Yes
IP_VLAN  4      EtherII           ip    200      6      Yes
sysname#
```

Queuing Commands

Use queuing commands to help solve performance degradation when there is network congestion.



Queuing method configuration differs across Switch models.

- Some models allow you to select a queuing method on a port-by-port basis. For example, port 1 can use Strictly Priority Queuing and ports 2-8 can use Weighted Round Robin.
- Other models allow you to specify one queuing method for all the ports at once.

65.1 Queuing Overview

The following queuing algorithms are supported by ZyXEL Switches:



Check your User's Guide for queuing algorithms supported by your model.

- **Strictly Priority Queuing (SPQ)** - services queues based on priority only. As traffic comes into the Switch, traffic on the highest priority queue, Q7 is transmitted first. When that queue empties, traffic on the next highest-priority queue, Q6 is transmitted until Q6 empties, and then traffic is transmitted on Q5 and so on. If higher priority queues never empty, then traffic on lower priority queues never gets sent.



Switch models which have only 4 queues, support a limited version of SPQ. The highest level queue is serviced using SPQ and the remaining queues use WRR queuing.

- **Weighted Fair Queuing (WFQ)**- guarantees each queue's minimum bandwidth based on its bandwidth weight (portion) when there is traffic congestion. WFQ is activated only when a port has more traffic than it can handle. Queues with larger weights get more guaranteed bandwidth than queues with smaller weights. This queuing mechanism is highly efficient in that it divides any available bandwidth across the different traffic queues. By default, the weight for Q0 is 1, for Q1 is 2, for Q2 is 3, and so on. Guaranteed bandwidth is calculated as follows:

$$\frac{\text{Queue Weight}}{\text{Total Queue Weight}} \times \text{Port Speed}$$

For example, using the default setting, Q0 on Port 1 gets a guaranteed bandwidth of:

$$\frac{1}{1+2+3+4+5+6+7+8} \times 100 \text{ Mbps} = 3 \text{ Mbps}$$

- **Weighted Round Robin Scheduling (WRR)** - services queues on a rotating basis and is activated only when a port has more traffic than it can handle. A queue is given an amount of bandwidth based on the queue weight value. Queues with larger weights get more service than queues with smaller weights. This queuing mechanism is highly efficient in that it divides any available bandwidth across the different traffic queues and returns to queues that have not yet emptied.
- **Hybrid Mode: WRR & SPQ or WFQ & SPQ** - some switch models allow you to configure higher priority queues to use SPQ and use WRR or WFQ for the lower level queues.

65.2 Command Summary: Port by Port Configuration

The following section lists the commands for this feature.

Table 156 Queuing Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>queue priority <0-7> level <0-7></code> | <p>Sets the IEEE 802.1p priority level-to-physical queue mapping.</p> <p><code>priority <0-7></code>: IEEE 802.1p defines up to eight separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service. Frames without an explicit priority tag are given the default priority of the ingress port.</p> <p><code>level <0-7></code>: The Switch has up to 8 physical queues that you can map to the 8 priority levels. On the Switch, traffic assigned to higher index queues gets through faster while traffic in lower index queues is dropped if the network is congested.</p> <p>Note: Some models only support 4 queues.</p> | C | 13 |
| <code>interface port-channel <port-list></code> | Enters subcommand mode for configuring the specified ports. | C | 13 |
| <code>spq</code> | Sets the switch to use Strictly Priority Queuing (SPQ) on the specified ports. | C | 13 |

Table 156 Queuing Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>ge-spq <q0 q1 ... q7></code> | Enables SPQ starting with the specified queue and subsequent higher queues on the Gigabit ports. | C | 13 |
| <code>hybrid-spq lowest-queue <q0 q1 ... q7></code> | Enables SPQ starting with the specified queue and subsequent higher queues on the ports. | C | 13 |
| <code>hybrid-spq <q0 q1 ... q7></code> | Enables SPQ starting with the specified queue and subsequent higher queues on the ports. | C | 13 |
| <code>no hybrid-spq</code> | Disables SPQ starting with the specified queue and subsequent higher queues on the ports. | C | 13 |
| <code>wrr</code> | Sets the switch to use Weighted Round Robin (WRR) on the specified ports. | C | 13 |
| <code>wfq</code> | Sets the switch to use Weighted Fair Queuing (WFQ) on the specified ports. | C | 13 |
| <code>weight <wt1> <wt2> ... <wt8></code> | Assigns a weight value to each physical queue on the Switch. When the Switch is using WRR or WFQ, bandwidth is divided across different traffic queues according to their weights. Queues with larger weights get more service than queues with smaller weights. Weight values range: 1-15. | C | 13 |
| <code>wrr <wt1> <wt2> ... <wt8></code> | Assigns a weight value to each physical queue on the Switch. | C | 13 |

65.3 Command Examples: Port by Port Configuration

This example configures WFQ on ports 1-5 and assigns weight values (1,2,3,4,12,13,14,15) to the physical queues (Q0 to Q8).

```

sysname(config)# interface port-channel 1-5
sysname(config-interface)# wfq
sysname(config-interface)# weight 1 2 3 4 12 13 14 15

```

65.4 Command Summary: System-Wide Configuration

The following section lists the commands for this feature.

Table 157 Queuing Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>queue priority <0-7> level <0-7></code> | <p>Sets the IEEE 802.1p priority level-to-physical queue mapping.</p> <p><code>priority <0-7></code>: IEEE 802.1p defines up to eight separate traffic types by inserting a tag into a MAC-layer frame that contains bits to define class of service. Frames without an explicit priority tag are given the default priority of the ingress port.</p> <p><code>level <0-7></code>: The Switch has up to 7 physical queues that you can map to the 8 priority levels. On the Switch, traffic assigned to higher index queues gets through faster while traffic in lower index queues is dropped if the network is congested.</p> <p>Note: Some models only support 4 queues.</p> | C | 13 |
| <code>spq</code> | Sets the Switch to use Strictly Priority Queuing (SPQ). | C | 13 |
| <code>wrr</code> | Sets the Switch to use Weighted Round Robin (WRR). | C | 13 |
| <code>wfq</code> | Sets the Switch to use Weighted Fair Queuing (WFQ). | C | 13 |
| <code>fe-spq <q0 q1 ... q7></code> | Enables SPQ starting with the specified queue and subsequent higher queues on the 10/100 Mbps ports. | C | 13 |

65.5 Command Examples: System-Wide

This example configures WFQ on the Switch and assigns weight values (1,2,3,4,12,13,14,15) to the physical queues (Q0 to Q8).

```
sysname(config)# wfq
sysname(config)# interface port-channel 1-5
sysname(config-interface)# weight 1 2 3 4 12 13 14 15
```

This example configures the Switch to use WRR as a queuing method but configures the Gigabit ports 9-12 to use SPQ for queues 5, 6 and 7.

```
sysname(config)# wrr
sysname(config)# interface port-channel 9-12
sysname(config-interface)# ge-spq 5
```


RADIUS Commands

Use these commands to configure external RADIUS (Remote Authentication Dial-In User Service) servers.

66.1 Command Summary

The following section lists the commands for this feature.

Table 158 radius-server Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show radius-server</code> | Displays RADIUS server settings. | E | 3 |
| <code>radius-server host <index> <ip> [auth-port <socket-number>] [key [cipher] <key-string>]</code> | Specifies the IP address of the RADIUS authentication server. Optionally, sets the UDP port number and shared secret. <i>index</i> : 1 or 2. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the <code>password encryption</code> command. <i>key-string</i> : 1-32 alphanumeric characters. | C | 14 |
| <code>radius-server mode <index- priority round-robin></code> | Specifies how the Switch decides which RADIUS server to select if you configure multiple servers. <i>index-priority</i> : The Switch tries to authenticate with the first configured RADIUS server. If the RADIUS server does not respond, then the Switch tries to authenticate with the second RADIUS server. <i>round-robin</i> : The Switch alternates between RADIUS servers that it sends authentication requests to. | C | 14 |
| <code>radius-server timeout <1-1000></code> | Specify the amount of time (in seconds) that the Switch waits for an authentication request response from the RADIUS server. In <i>index-priority</i> mode, the timeout is divided by the number of servers you configure. For example, if you configure two servers and the timeout is 30 seconds, then the Switch waits 15 seconds for a response from each server. | C | 14 |
| <code>no radius-server <index></code> | Resets the specified RADIUS server to its default values. | C | 14 |

Table 159 radius-accounting Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show radius-accounting</code> | Displays RADIUS accounting server settings. | E | 3 |
| <code>radius-accounting timeout <1- 1000></code> | Specifies the RADIUS accounting server timeout value. | C | 13 |

Table 159 radius-accounting Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| radius-accounting host <index> <ip> [acct-port <socket-number>] [key [cipher] <key-string>] | Specifies the IP address of the RADIUS accounting server. Optionally, sets the port number and key of the external RADIUS accounting server. <i>index</i> : 1 or 2. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the <code>password encryption</code> command. <i>key-string</i> : 1-32 alphanumeric characters. | C | 13 |
| no radius-accounting <index> | Resets the specified RADIUS accounting server to its default values. | C | 13 |

66.2 Command Examples

This example sets up one primary RADIUS server (172.16.10.10) and one secondary RADIUS server (172.16.10.11). The secondary RADIUS server is also the accounting server.

```

sysname# configure
sysname(config)# radius-server mode index-priority
sysname(config)# radius-server host 1 172.16.10.10
sysname(config)# radius-server host 2 172.16.10.11
sysname(config)# radius-accounting host 1 172.16.10.11
sysname(config)# exit

```

Remote Management Commands

Use these commands to specify a group of one or more “trusted computers” from which an administrator may use one or more services to manage the Switch and to decide what services you may use to access the Switch.

67.1 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 160 remote-management User-input Values

| COMMAND | DESCRIPTION |
|--------------|-------------|
| <i>index</i> | 1-4 |

The following section lists the commands for this feature.

Table 161 remote-management Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show remote-management [<i>index</i>]</code> | Displays all secured client information or, optionally, a specific group of secured clients. | E | 3 |
| <code>remote-management <<i>index</i>></code> | Enables the specified group of trusted computers. | C | 13 |
| <code>no remote-management <<i>index</i>></code> | Disables the specified group of trusted computers. | C | 13 |
| <code>remote-management <<i>index</i>> start-addr <<i>ip</i>> end-addr <<i>ip</i>> service <[telnet] [ftp] [http] [icmp] [snmp] [ssh] [https]></code> | Specifies a group of trusted computer(s) from which an administrator may use the specified service(s) to manage the Switch. Group 0.0.0.0 - 0.0.0.0 refers to every computer. | C | 13 |
| <code>no remote-management <<i>index</i>> service <[telnet] [ftp] [http] [icmp] [snmp] [ssh] [https]></code> | Disables the specified service(s) for the specified group of trusted computes. | C | 13 |

Table 162 service-control Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>show service-control</code> | Displays service control settings. | E | 3 |
| <code>service-control console <<i>timeout</i>></code> | Defines the timeout period (in minutes) for a management session via the console port. | C | 13 |
| <code>service-control ftp</code> | Allows FTP access to the Switch. | C | 13 |

Table 162 service-control Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| service-control ftp <socket-number> <timeout> | Specifies the service port for the FTP service and defines the timeout period (in minutes). | C | 13 |
| no service-control ftp | Disables FTP access to the Switch. | C | 13 |
| service-control http | Allows HTTP access to the Switch. | C | 13 |
| service-control http <socket-number> <timeout> | Specifies the service port for the HTTP service and defines the timeout period (in minutes). <i>timeout: 1-255</i> | C | 13 |
| no service-control http | Disables HTTP access to the Switch. | C | 13 |
| service-control https | Allows HTTPS access to the Switch. | C | 13 |
| service-control https <socket-number> | Specifies the service port for the HTTPS service. | C | 13 |
| no service-control https | Disables HTTPS access to the Switch. | C | 13 |
| service-control icmp | Allows ICMP management packets. | C | 13 |
| no service-control icmp | Disables ICMP access to the Switch. | C | 13 |
| service-control snmp | Allows SNMP management. | C | 13 |
| no service-control snmp | Disables SNMP access to the Switch. | C | 13 |
| service-control ssh | Allows SSH access to the Switch. | C | 13 |
| service-control ssh <socket-number> | Specifies the service port for the SSH service. | C | 13 |
| no service-control ssh | Disables SSH access to the Switch. | C | 13 |
| service-control telnet | Allows Telnet access to the Switch. | C | 13 |
| service-control telnet <socket-number> <timeout> | Specifies the service port for the Telnet service and defines the timeout period (in minutes). | C | 13 |
| no service-control telnet | Disables Telnet access to the Switch. | C | 13 |

67.2 Command Examples

This example allows computers in subnet 172.16.37.0/24 to access the Switch through any service except SNMP, allows the computer at 192.168.10.1 to access the Switch only through SNMP, and prevents other computers from accessing the Switch at all.

```

sysname# configure
sysname(config)# remote-management 1 start-addr 172.16.37.0 end-addr
--> 172.16.37.255 service telnet ftp http icmp ssh https
sysname(config)# remote-management 2 start-addr 192.168.10.1 end-addr
--> 192.168.10.1 service snmp
sysname(config)# exit

```

This example disables all SNMP and ICMP access to the Switch.

```
sysname# configure
sysname(config)# no service-control snmp
sysname(config)# no service-control icmp
sysname(config)# exit
```

RIP Commands

This chapter explains how to use commands to configure the Routing Information Protocol (RIP) on the Switch.

68.1 RIP Overview

RIP is a protocol used for exchanging routing information between routers on a network. Information is exchanged by routers periodically advertising a routing table. The Switch can be configured to receive and incorporate routing table information sent from other routers, to only send routing information to other routers, both send and receive routing information, or to neither send nor receive routing information to or from other routers on the network.

68.2 Command Summary

The following section lists the commands for this feature.

Table 163 rip Command Summary

| COMMAND | DESCRIPTION | M | P |
|--------------------------------|--|---|----|
| <code>show router rip</code> | Displays global RIP settings. | E | 3 |
| <code>show ip protocols</code> | Displays the routing protocol the Switch is using and its administrative distance value. | E | 3 |
| <code>router rip</code> | Enables and enters the RIP configuration mode on the Switch. | C | 13 |

Table 163 rip Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>distance <10-255></code> | <p>When two different routing protocols, such as RIP and OSPF provide multiple routes to the same destination, the Switch can use the administrative distance of the route source to determine which routing protocol to use and add the route to the routing table.</p> <p>Sets the administrative distance (from 10 to 255) that is assigned to the routes learned by RIP.</p> <p>The lower the administrative distance value is, the more preferable the routing protocol is. If two routes have the same administrative distance value, the Switch uses the route that has the lowest metric value.</p> <p>Note: You cannot set two routing protocols to have the same administrative distance.</p> | C | 13 |
| <code>exit</code> | Leaves the RIP configuration mode. | C | 13 |
| <code>no router rip</code> | Disables RIP on the Switch. | C | 13 |
| <code>interface route-domain <ip-address>/<mask-bits></code> | Enters the configuration mode for this routing domain. | C | 13 |
| <code>ip rip direction <Outgoing Incoming Both None> version <v1 v2b v2m></code> | Sets the RIP direction and version in this routing domain. | C | 13 |

68.3 Command Examples

This example:

- Enables RIP.
- Enters the IP routing domain **172.16.1.1** with subnet mask **255.255.255.0**.
- Sets the RIP direction in this routing domain to **Both** and the version to 2 with subnet broadcasting (**v2b**); the Switch will send and receive RIP packets in this routing domain.

```
sysname(config)# router rip
sysname(config-rip)# exit
sysname(config)# interface route-domain 172.16.1.1/24
sysname(config-if)# ip rip direction Both version v2b
```

69.1 RMON Overview

Similar to SNMP, RMON (Remote Network Monitor) allows you to gather and monitor network traffic.

Both SNMP and RMON use an agent, known as a probe, which are software processes running on network devices to collect information about network traffic and store it in a local MIB (Management Information Base). With SNMP, a network manager has to constantly poll the agent to obtain MIB information. The probe on the Switch communicates with the network manager via SNMP.

RMON groups contain detailed information about specific activities. The following table describes the four RMON groups that your Switch supports.

Table 164 Supported RMON Groups

| GROUP | DESCRIPTION |
|------------|--|
| Statistics | Records current network traffic information on a specified Ethernet port. |
| History | Records historical network traffic information on a specified Ethernet port for a certain time period. |
| Alarm | Provides alerts when configured alarm conditions are met. |
| Event | Defines event generation and resulting actions to be taken based on an alarm. |

69.2 User Input Values

This section lists the common term definition appears in this chapter.

Table 165 rmon command user input values

| USER INPUT | DESCRIPTION |
|-----------------------------|---|
| <i>event-index</i> | This is an event's index number in the event table, between 1 and 65535. |
| <i>alarm-index</i> | This is an alarm's index number in the alarm table, between 1 and 65535. |
| <i>etherstats-index</i> | This is an entry's index number in the Ethernet statistics table, between 1 and 65535. |
| <i>historycontrol-index</i> | This is an entry's index number in the history control table, between 1 and 65535. |
| <i>owner</i> | This is a person's name who will handle the event, alarm, historycontrol, or Ethernet statistics entry. |
| <i>interface-id</i> | This is a port that the Switch will poll for data. |

69.3 Command Summary

The following section lists the commands for this feature.

Table 166 rmon Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>rmon alarm alarmtable <alarm-index> variable <variable> interval <interval-integer> sample-type <absolute delta> startup-alarm <startup-alarm> rising-threshold <rising-integer> <event-index> falling-threshold <falling-integer> <event-index> [owner <owner>]</code> | Sets an alarm that occurs when the sampled data exceeds the specified threshold. See Section 69.3.2 on page 258 for more information. | C | 13 |
| <code>rmon event eventtable <event-index> [log] [trap <community>] [owner <owner>] [description <description>]</code> | Sets the actions that the Switch takes when an associated alarm is generated by the Switch. <i>log</i> : set this to have the Switch record the logs for the alarm <i>trap <community></i> : set this to have the Switch send a trap with the specified community. <i>description</i> : the description of the event. | C | 13 |
| <code>rmon history historycontrol <historycontrol-index> buckets <1-65535> interval <1-3600> port-channel <interface-id> [owner <owner>]</code> | Sets RMON history configuration settings. <i>buckets <1-65535></i> : the number of data samplings the network manager requests the Switch to store. At the time of writing, the Switch can only store up to 200 data samplings although you can configure a bucket number higher than 200. <i>interval <1-3600></i> : the time in seconds between data samplings. | C | 13 |
| <code>rmon statistics etherstats <etherstats-index> port-channel <interface-id> [owner <owner>]</code> | Sets to collect network traffic on the specified Ethernet port since the last time the Switch was reset. | C | 13 |
| <code>no rmon alarm alarmtable <alarm-index></code> | Removes the specified alarm's settings. | C | 13 |
| <code>no rmon event eventtable <event-index></code> | Removes the action's settings of the specified event. | C | 13 |
| <code>no rmon history historycontrol <historycontrol-index></code> | Removes the RMON history configuration settings for the specified event. | C | 13 |
| <code>no rmon statistics etherstats <etherstats-index></code> | Stops collecting network traffic for the specified event. | C | 13 |
| <code>show rmon alarm alarmtable [alarm-index]</code> | Displays all or the specified alarm settings. | E | 3 |
| <code>show rmon event eventtable [event-index]</code> | Displays all or the specified event settings. | E | 3 |
| <code>show rmon history historycontrol [index <historycontrol-index>]</code> | Displays all historical network traffic statistics or only the specified entry's. | E | 3 |
| <code>show rmon history historycontrol port-channel <interface-id></code> | Displays historical network traffic statistics for the specified port. | E | 3 |
| <code>show rmon statistics etherstats [index <etherstats-index>]</code> | Displays all current network traffic statistics or only the specified entry's. | E | 3 |
| <code>show rmon statistics etherstats port-channel <interface-id></code> | Displays current network traffic statistics for the specified port. | E | 3 |

69.3.1 RMON Event Command Example

This example shows how to configure the Switch's action when an RMON event using the following settings:

- event index number: 2
- enable event logging and SNMP traps: Yes
- the trap's community: public
- who will handle this alarm: operator
- additional description for this event entry: test

This example also shows how to display the setting results.

```

ras# config
ras(config)# rmon event eventtable 2 log trap public owner operator
description test
ras(config)# exit
ras# show rmon event eventtable 2
  Event 2 owned by operator is valid
    eventType: logandtrap
    eventCommunity: public
    eventDescription: test

```

69.3.2 RMON Alarm Command Example

Syntax:

```

rmon alarm alarmtable <alarm-index> variable <variable> interval <interval-integer>
sample-type <absolute|delta> startup-alarm <startup-alarm> rising-threshold
<rising-integer> <event-index> falling-threshold <falling-integer> <event-index>
[owner <owner>]

```

where

| | |
|-----------------|--|
| 1-65535 | This is an alarm's index number in the alarm table. |
| <i>variable</i> | <p>This is the variable(s) whose data is sampled. The allowed options are:</p> <ul style="list-style-type: none"> • [ifType.<port>] • [ifMtu.<port>] • [ifSpeed.<port>] • [ifAdminStatus.<port>] • [ifOperStatus.<port>] • [ifLastChange.<port>] • [ifInOctets.<port>] • [ifInUcastPkts.<port>] • [ifInNUcastPkts.<port>] • [ifInDiscards.<port>] • [ifInErrors.<port>] • [ifInUnknownProtos.<port>] • [ifOutOctets.<port>] • [ifOutUcastPkts.<port>] • [ifOutNUcastPkts.<port>] • [ifOutDiscards.<port>] • [ifOutErrors.<port>] • [ifOutQLen.<port>] • [sysMgmtCPUUsage.<index>] • [sysMemoryPoolUtil.<index>] • [<OID>] |

| | |
|----------------------------------|---|
| <i>interval-integer</i> | This is the time interval (in seconds) between data samplings. |
| <i>absolute</i> <i> delta</i> | This is the method of obtaining the sample value and calculating the value to be compared against the thresholds. <ul style="list-style-type: none"> <i>absolute</i> - the sampling value of the selected variable will be compared directly with the thresholds. <i>delta</i> - the last sampling value of the selected variable will be subtracted from the current sampling value first. Then use the difference to compare with the thresholds. |
| <i>startup-alarm</i> | Specify when the Switch should generate an alarm regarding to the rising and/or falling thresholds. <ul style="list-style-type: none"> <i>risingAlarm</i> - the Switch generates an alarm if the sampling value (or calculated value) is greater than or equal to the rising threshold. <i>fallingAlarm</i> - the Switch generates an alarm if the sampling value (or calculated value) is less than or equal to the falling threshold. <i>risingOrFallingAlarm</i> - the Switch generates an alarm either when the sampling value (or calculated value) is greater than or equal to the rising threshold or when the sampling value (or calculated value) is less than or equal to the falling threshold. |
| <i>rising-integer</i> | Specify an integer for the rising threshold. When a value that is greater or equal to this threshold, the Switch generates an alarm. |
| <i>rising-event-index</i> | Specify an event's index number (between 0 and 65535). The Switch will take the corresponding action of the selected event for the rising alarm. Set this to 0 if you do not want to take any action for the alarm. |
| <i>falling-integer</i> | Specify an integer for the falling threshold. When a value that is smaller or equal to this threshold, the Switch generates an alarm. |
| <i>falling-event-index</i> | Specify an event's index number (between 0 and 65535). The Switch will take the corresponding action of the selected event for the falling alarm. Set this to 0 if you do not want to take any action for the alarm. |
| <i>owner</i> | Specify who should handle this alarm. |

This example shows you how to configure an alarm using the following settings:

- alarm index number: 2
- variable: getting the number of errored packets received on port 1
- how often to get a data sample: every 60 seconds
- sampling method: delta
- when to send an alarm: when the value is higher than the rising threshold
- the rising threshold: 50
- which event's action should be taken for the rising alarm: 2 (see [Section 69.3.1 on page 258](#))
- the falling threshold: 0
- which event's action should be taken for the falling alarm: 0 (see [Section 69.3.1 on page 258](#))
- who will handle this alarm: operator

This example also shows how to display the setting results.

```
ras# config
ras(config)# rmon alarm alarmtable 2 variable ifInErrors.1 interval 60
sample-type delta startup-alarm rising rising-threshold 50 2 falling-
threshold 0 2 owner operator
ras(config)# exit
ras# show rmon alarm alarmtable
Alarm 2 owned by operator is valid
  alarmVariable: ifInErrors.1
  alarmInterval: 60
  alarmSampleType: delta
  alarmStartupAlarm: rising
  alarmRisingThreshold: 50
  alarmRisingEventIndex: 2
  alarmFallingThreshold: 0
  alarmFallingEventIndex: 0
  Last value monitored: 0
ras#
```

69.3.3 RMON Statistics Command Example

This example shows how to configure the settings to display current network traffic statistics using the following settings:

- the Ethernet statistics table entry's index number: 1
- collecting data samples from which port: 12

This example also shows how to display the data collection results.

```
ras# config
ras(config)# rmon statistics etherstats 1 port-channel 12
ras(config)# exit
ras# show rmon statistics etherstats index 1
Statistics 1 owned by is valid
Monitor on interface port-channel 12
etherStatsDropEvents: 0
etherStatsOctets: 1576159
etherStatsPkts: 19861
etherStatsBroadcastPkts: 16721
etherStatsMulticastPkts: 1453
etherStatsCRCAlignErrors: 2
etherStatsUndersizePkts: 0
etherStatsOversizePkts: 0
etherStatsFragments: 0
etherStatsJabbers: 0
etherStatsCollisions: 0
Packet length distribution:
  64: 17952
  65-127: 666
  128-255: 671
  256-511: 509
  512-1023: 26
  1024-1518: 37
ras#
```

69.3.4 RMON History Command Example

This example shows how to configure the settings to display historical network traffic statistics using the following settings:

- the history control table entry's index number: 1
- how many data sampling data you want to store: 10
- time interval between data samplings: 10 seconds
- collecting data samples from which port: 12

This example also shows how to display the data collection results.

```
ras# config
ras(config)# rmon history historycontrol 1 buckets 10 interval 10 port-
channel 12
ras(config)# exit
ras# show rmon history historycontrol index 1
History control 1 owned by is valid
Monitors interface port-channel 12 every 10 sec.
historyControlBucketsRequested: 10
historyControlBucketsGranted: 10
Monitored history 1:
  Monitored at 0 days 00h:08m:59s
  etherHistoryIntervalStart: 539
  etherHistoryDropEvents: 0
  etherHistoryOctets: 667217
  etherHistoryPkts: 7697
  etherHistoryBroadcastPkts: 5952
  etherHistoryMulticastPkts: 505
  etherHistoryCRCAlignErrors: 2
  etherHistoryUndersizePkts: 0
  etherHistoryOversizePkts: 0
  etherHistoryFragments: 0
  etherHistoryJabbers: 0
  etherHistoryCollisions: 0
  etherHistoryUtilization: 72
Monitored history 2:
  Monitored at 0 days 00h:09m:08s
  etherHistoryIntervalStart: 548
  etherHistoryDropEvents: 0
  etherHistoryOctets: 673408
  etherHistoryPkts: 7759
  etherHistoryBroadcastPkts: 5978
  etherHistoryMulticastPkts: 519
  etherHistoryCRCAlignErrors: 2
  etherHistoryUndersizePkts: 0
  etherHistoryOversizePkts: 0
  etherHistoryFragments: 0
  etherHistoryJabbers: 0
  etherHistoryCollisions: 0
  etherHistoryUtilization: 0
ras#
```

Running Configuration Commands

Use these commands to back up and restore configuration and firmware.

70.1 Switch Configuration File

When you configure the Switch using either the CLI (Command Line Interface) or web configurator, the settings are saved as a series of commands in a configuration file on the Switch called `running-config`. You can perform the following with a configuration file:

- Back up Switch configuration once the Switch is set up to work in your network.
- Restore a previously-saved Switch configuration.
- Use the same configuration file to set all switches (of the same model) in your network to the same settings.

You may also edit a configuration file using a text editor. Make sure you use valid commands.



The Switch rejects configuration files with invalid or incomplete commands.

70.2 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 167 running-config User-input Values

| COMMAND | DESCRIPTION |
|------------------|--|
| <i>attribute</i> | Possible values: active, name, speed-duplex, bpdu-control, flow-control, intrusion-lock, vlanlq, vlanlq-member, bandwidth-limit, vlan-stacking, port-security, broadcast-storm-control, mirroring, port-access-authenticator, queuing-method, igmp-filtering, spanning-tree, mrstp, protocol-based-vlan, port-based-vlan, mac-authentication, trtcm, ethernet-oam, loopguard, arp-inspection, dhcp-snooping. |

The following section lists the commands for this feature.

Table 168 running-config Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| show running-config [interface port-channel <port-list> [<attribute> [<...>]]] | Displays the current configuration file. This file contains the commands that change the Switch's configuration from the default settings to the current configuration. Optionally, displays current configuration on a port-by-port basis. | E | 3 |
| show running-config help | Provides more information about the specified command. | E | 3 |
| show running-config page | Displays the current configuration file page by page. | E | 3 |
| copy running-config interface port-channel <port> <port-list> [<attribute> [<...>]] | Clones (copies) the attributes from the specified port to other ports. Optionally, copies the specified attributes from one port to other ports. | E | 13 |
| copy running-config help | Provides more information about the specified command. | E | 13 |
| copy running-config slot <slot> <slot-list> | Clones (copies) the attributes from the specified slot to other slots. | E | 13 |
| copy running-config slot <slot> <slot-list> [bandwidth-limit ...] | Copies the specified attributes from one slot to other slots. | E | 13 |
| erase running-config | Resets the Switch to the factory default settings. | E | 13 |
| reload factory-default | Resets the Switch to the factory default settings, including default user name and password. | E | 14 |
| erase running-config interface port-channel <port-list> [<attribute> [<...>]] | Resets to the factory default settings on a per-port basis and optionally on a per-feature configuration basis. | E | 13 |
| erase running-config help | Provides more information about the specified command. | E | 13 |
| sync running-config | Uses the current configuration on the active management card to update the current configuration on the standby management card. | E | 13 |

70.3 Command Examples

This example resets the Switch to the factory default settings.

```
sysname# erase running-config
sysname# write memory
```

This example copies all attributes of port 1 to port 2 and copies selected attributes (active, bandwidth limit and STP settings) from port 1 to ports 5-8

```
sysname# copy running-config interface port-channel 1 2
sysname# copy running-config interface port-channel 1 5-8 active
bandwidth-limit spanning-tree
```

This chapter shows you how to configure sFlow to have the Switch monitor traffic in a network and send information to an sFlow collector for analysis.

71.1 sFlow Overview

sFlow (RFC 3176) is a standard technology for monitoring switched networks. An sFlow agent embedded on a switch or router gets sample data and packet statistics from traffic forwarded through its ports. The sFlow agent then creates sFlow data and sends it to an sFlow collector. The sFlow collector is a server that collects and analyzes sFlow datagram. An sFlow datagram includes packet header, input and output interface, sampling process parameters and forwarding information.

sFlow minimizes impact on CPU load of the Switch as it analyzes sample data only. sFlow can continuously monitor network traffic and create reports for network performance analysis and troubleshooting. For example, you can use it to know which IP address or which type of traffic caused network congestion.

71.2 Command Summary

The following section lists the commands for this feature.

Table 169 sflow Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>no sflow</code> | Disables sFlow on this port. | C | 13 |
| <code>no sflow collector <ip-address></code> | Removes the specified collector IP address from the port. | C | 13 |
| <code>sflow</code> | Enables sFlow on this port. The Switch will monitor traffic on this port and generate and send sFlow datagram to the specified collector. | C | 13 |
| <code>sflow collector <ip-address></code> <code>[poll-interval <20-120>]</code> <code>[sample-rate <256-65535>]</code> | Specifies a collector for this port. You can set a time interval (from 20 to 120 in seconds) the Switch waits before sending the sFlow datagram and packet counters for this port to the collector. You can also set a sample rate (N) from 256 to 65535. The Switch captures every one out of N packets for this port to create sFlow datagram. | C | 13 |
| <code>no sflow</code> | Disables the sFlow agent on the Switch. | C | 13 |

Table 169 sflow Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| no sflow collector <ip-address> | Removes an sFlow collector entry. | C | 13 |
| sflow | Enables the sFlow agent on the Switch. | C | 13 |
| sflow collector <ip-address> [udp-port <udp-port>] | Configures an sFlow collector and the UDP port the Switch uses to send sFlow datagram to the collector. The default UDP port is 6343. | C | 13 |
| show sflow | Displays sFlow settings on the Switch. | E | 3 |

71.3 Command Examples

This example enables the sFlow agent on the Switch and configures an sFlow collector with the IP address 10.1.1.58 and UDP port 6343. This example also enables sFlow on ports 1, 2, 3 and 4 and configures the same collector, sample rate and poll interval for these ports.

```

sysname(config)# sflow
sysname(config)# sflow collector 10.1.1.58 udp-port 6343
sysname(config)# interface port-channel 1,2,3,4
sysname(config-interface)# sflow
sysname(config-interface)# sflow collector 10.1.1.58 poll-interval 120
sample-rate 2500
sysname(config-interface)# exit
sysname(config)# exit
sysname# show sflow
  sFlow version: 5
  sFlow Global Information:
    sFlow Status: Active
    index  Collector Address  UDP port
    ----  -
    1      10.1.1.58          6343

  sFlow Port Information:
    Port  Active  Sample-rate  Poll-interval  Collector Address
    ----  -
    1     Yes    2500         120            10.1.1.58
    2     Yes    2500         120            10.1.1.58
    3     Yes    2500         120            10.1.1.58
    4     Yes    2500         120            10.1.1.58
    5     No     32768        120            0.0.0.0
    6     No     32768        120            0.0.0.0
    7     No     32768        120            0.0.0.0
  ....

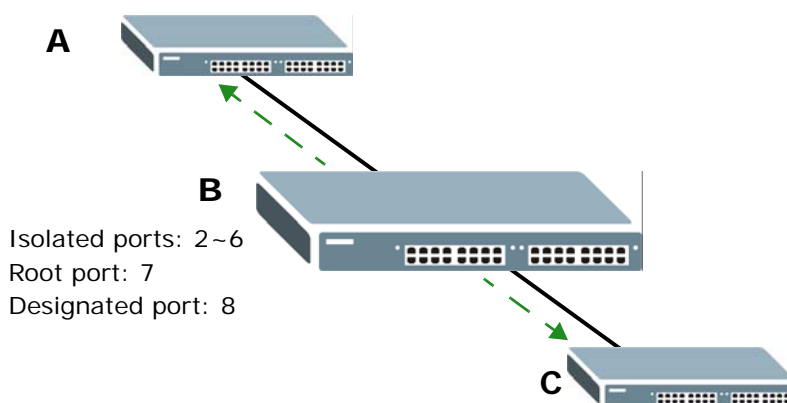
```

Smart Isolation Commands

This chapter explains how to use commands to configure smart isolation on the Switch.

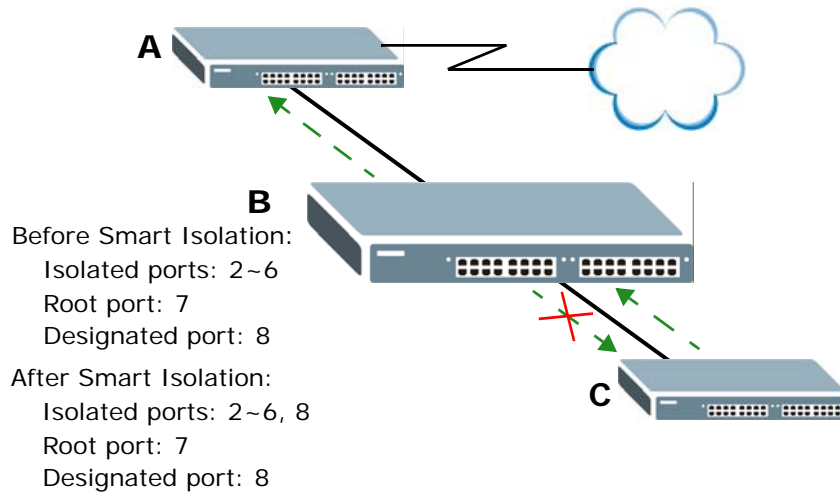
72.1 Smart Isolation Overview

To block traffic between two specific ports within the Switch, you can use port isolation or private VLAN (see [Chapter 63 on page 238](#) for more information). However, it does not work across multiple switches. For example, broadcast traffic from isolated ports on a switch (say **B**) can be forwarded to all ports on other switches (**A** and **C**), including the isolated ports.



Smart isolation allows you to prevent isolated ports on different switches from transmitting traffic to each other. After you enable RSTP/MRSTP and smart isolation on the Switch, the designated port(s) will be added to the isolated port list. In the following example, switch **A** is the root bridge. Switch **B**'s root port **7** connects to switch **A** and switch **B**'s designated port **8**

connects to switch **C**. Traffic from isolated ports on switch **B** can only be sent through non-isolated port **1** or root port **7** to switch **A**. This prevents isolated ports on switch **B** sending traffic through designated port **8** to switch **C**. Traffic received on designated port **8** from switch **C** will not be forwarded to any other isolated ports on switch **B**.



You should enable RSTP or MRSTP before you can use smart isolation on the Switch. If the network topology changes, the Switch automatically updates the isolated port list with the latest designated port information.



The uplink port connected to the Internet should be the root port. Otherwise, with smart isolation enabled, the isolated ports cannot access the Internet.

72.2 Command Summary

The following section lists the commands for this feature.

Table 170 smart-isolation Command Summary

| COMMAND | DESCRIPTION | M | P |
|-----------------------------------|--|---|----|
| <code>no smart-isolation</code> | Disables smart isolation on the Switch. | C | 13 |
| <code>show smart-isolation</code> | Enables smart isolation on the Switch. | E | 3 |
| <code>smart-isolation</code> | Displays the smart isolation status and information on the Switch. | C | 13 |

72.3 Command Examples

This example enables smart isolation and displays smart isolation status and information on the Switch. You should have configured RSTP or MRSTP on the Switch in order to have smart isolation work by adding the designated port(s) to the isolated port list. You also have created VLAN 200 and configured a private VLAN rule for VLAN 200 to put ports 3, 4 and 5 in the isolated port list. In this example, the designated port 7 is added to the isolated port list after smart isolation is enabled.

```

sysname# configure
sysname(config)# spanning-tree mode rstp
sysname(config)# spanning-tree
sysname(config)# spanning-tree priority 32768
sysname(config)# spanning-tree 3-5, 7-8
sysname(config)# vlan 200
sysname(config-vlan)# fixed 3-5, 7-8
sysname(config-vlan)# untagged 3-5, 7-8
sysname(config-vlan)# exit
sysname(config)# private-vlan name pvlan-200 vlan 200 promiscuous-port 7-8
sysname(config)# smart-isolation
sysname(config)# exit
sysname# show smart-isolation
    smart isolation enable

Private VLAN:
  Original VLAN:
    VLAN 200
      isolated 3-5
      promiscuous 7-8

  Smart Isolated VLAN:
    VLAN 200
      isolated 3-5,7
      promiscuous 8

sysname#

```

The following table describes the labels in this screen.

Table 171 show smart-isolation

| LABEL | DESCRIPTION |
|-------------------------|---|
| Port isolation | This section is available only when you have configured port isolation on the Switch. The following fields display the port isolation information before and after smart isolation is enabled. |
| original isolated ports | This field displays the isolated port list before smart isolation is enabled. |
| smart isolated ports | This field displays the isolated port list after smart isolation is enabled. |
| Private VLAN | This section is available only when you have configured private VLAN on the Switch. The following fields display the private VLAN information before and after smart isolation is enabled. |

Table 171 show smart-isolation (continued)

| LABEL | DESCRIPTION |
|---------------------|--|
| Original VLAN | This section displays the VLAN ID and isolated and promiscuous port list before smart isolation is enabled |
| Smart Isolated VLAN | This section displays the VLAN ID and isolated and promiscuous port list after smart isolation is enabled |

SNMP Server Commands

Use these commands to configure SNMP on the Switch.

73.1 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 172 snmp-server User-input Values

| COMMAND | DESCRIPTION |
|-----------------|--|
| <i>property</i> | 1-32 alphanumeric characters |
| <i>options</i> | aaa: authentication, authorization, accounting. interface: linkup, linkdown, autonegotiation, lldp, transceiver-ddm. ip: ping, traceroute. switch: stp, mactable, rmon, cfm. system: coldstart, warmstart, fanspeed, temperature, voltage, reset, timesync, intrusionlock, loopguard, errdisable, poe. |

The following section lists the commands for this feature.

Table 173 snmp-server Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| show snmp-server | Displays SNMP settings. | E | 3 |
| snmp-server <[contact <system-contact>] [location <system-location>]> | Sets the geographic location and the name of the person in charge of this Switch. <i>system-contact</i> : 1-32 English keyboard characters; spaces are allowed. <i>system-location</i> : 1-32 English keyboard characters; spaces are allowed. | C | 13 |
| snmp-server version <v2c v3 v3v2c> | Sets the SNMP version to use for communication with the SNMP manager. | C | 13 |
| snmp-server get-community [cipher] <property> | Sets the get community. Only for SNMPv2c or lower. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the password encryption command. | C | 13 |
| snmp-server set-community [cipher] <property> | Sets the set community. Only for SNMPv2c or lower. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the password encryption command. | C | 13 |

Table 173 snmp-server Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| snmp-server trap-community [cipher] <property> | Sets the trap community. Only for SNMPv2c or lower. cipher: inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the password encryption command. | C | 13 |
| snmp-server trap-destination <ip> [udp-port <socket-number>] [version <v1 v2c v3>] [username <name>] | Sets the IP addresses of up to four SNMP managers (stations to send your SNMP traps to). You can configure up to four managers. | C | 13 |
| snmp-server trap-destination <ip> enable traps <aaa interface ip switch system > [options] | Sets the types of SNMP traps that should be sent to the specified SNMP manager. options: enter the trap type you want to configure here, such as timesync, intrusionlock, loopguard, errdisable, poe, loginrecord, linkup, linkdown, autonegotiation, lldp, transceiver-ddm, storm-control, zuld, authentication, authorization, accounting, ping, traceroute, stp, mactable, rmon, cfm, or classifier. | C | 13 |
| no snmp-server trap-destination <ip> | Deletes the specified SNMP manager. | C | 13 |
| interface port-channel <port- list> | Enters config-interface mode for the specified port(s). | C | 13 |
| snmp trap [options] | Enables sending of SNMP traps on this port. The Switch sends the related traps received on this port to the SNMP manager. options: enter the trap type you want to configure here, such as intrusionlock, loopguard, errdisable, poe, linkup, linkdown, autonegotiation, lldp, transceiver-ddm, storm-control, or zuld. | C | 13 |
| no snmp trap [options] | Disables sending of SNMP traps on this port. The Switch sends the related traps received on this port to the SNMP manager. options: enter the trap type you want to configure here, such as intrusionlock, loopguard, errdisable, poe, linkup, linkdown, autonegotiation, lldp, transceiver-ddm, storm-control, or zuld. | C | 13 |

Table 173 snmp-server Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| snmp-server username <name> sec-level <noauth auth priv> [auth <md5 sha> auth-password [cipher] <password>] [priv <des aes> priv-password [cipher] <password>] group <group-name> | <p>Sets the authentication level for SNMP v3 user authentication. Optionally, specifies the authentication and encryption methods for communication with the SNMP manager.</p> <p><i>name</i>: Enter the SNMP username.</p> <p><i>noauth</i>: Use the username as the password string sent to the SNMP manager. This is equivalent to the Get, Set and Trap Community in SNMP v2c. This is the lowest security level.</p> <p><i>auth</i>: Implement an authentication algorithm for SNMP messages sent by this user.</p> <p><i>priv</i>: Implement privacy settings and encryption for SNMP messages sent by this user. This is the highest security level.</p> <p><i>auth-password</i>: Set the authentication password for SNMP messages sent by this user.</p> <p><i>priv-password</i>: Set the privacy settings password for SNMP messages sent by this user.</p> <p><i>group-name</i>: Set the View-based Access Control Model (VACM) group. Available group names are:</p> <ul style="list-style-type: none"> <i>admin</i>: The user belongs to the admin group and has maximum access rights to the Switch. <i>readwrite</i>: The user can read and configure the Switch except for confidential options (such as user account and AAA configuration options.) <i>readonly</i>: The user can read but cannot make any configuration changes. <p><i>cipher</i>: Inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the <code>password encryption</code> command.</p> <p>Note: The settings on the SNMP manager must be set at the same security level or higher than the security level settings on the Switch.</p> | C | 14 |
| no snmp-server username <name> | Removes the specified SNMP user's information. | C | 14 |
| show snmp-server [user] | Displays the SNMP information on the Switch. The user flag displays SNMP user information. | E | 3 |

Table 174 snmp-server trap-destination enable traps Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| snmp-server trap-destination <ip> enable traps | Enables sending SNMP traps to a manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps | Disables sending of SNMP traps to a manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps aaa | Sends all AAA traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps aaa | Prevents the Switch from sending any AAA traps to the specified manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps aaa <options> | Sends the specified AAA traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps aaa <options> | Prevents the Switch from sending the specified AAA traps to the specified manager. | C | 13 |

Table 174 snmp-server trap-destination enable traps Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| snmp-server trap-destination <ip> enable traps interface | Sends all interface traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps interface | Prevents the Switch from sending any interface traps to the specified manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps interface <options> | Sends the specified interface traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps interface <options> | Prevents the Switch from sending the specified interface traps to the specified manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps ip | Sends all IP traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps ip | Prevents the Switch from sending any IP traps to the specified manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps ip <options> | Sends the specified IP traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps ip <options> | Prevents the Switch from sending the specified IP traps to the specified manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps switch | Sends all switch traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps switch | Prevents the Switch from sending any switch traps to the specified manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps switch <options> | Sends the specified switch traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps switch <options> | Prevents the Switch from sending the specified switch traps to the specified manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps system | Sends all system traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps system | Prevents the Switch from sending any system traps to the specified manager. | C | 13 |
| snmp-server trap-destination <ip> enable traps system <options> | Sends the specified system traps to the specified manager. | C | 13 |
| no snmp-server trap-destination <ip> enable traps system <options> | Prevents the Switch from sending the specified system traps to the specified manager. | C | 13 |

73.2 Command Examples

This example sets the Switch to not send the linkup and linkdown traps received on port 3 to the SNMP manager.

```
sysname# configure
sysname(config)# interface port-channel 3
sysname(config-interface)# no snmp trap linkup linkdown
```

This example shows you how to display the SNMP information on the Switch.

```
sysname# show snmp-server

[General Setting]
SNMP Version      : v2c
Get Community     : public
Set Community     : public
Trap Community    : public

[ Trap Destination ]
Index      Version      IP              Port  Username
-----
   1      v2c          0.0.0.0        162
   2      v2c          0.0.0.0        162
   3      v2c          0.0.0.0        162
   4      v2c          0.0.0.0        162
```

This example shows you how to display all SNMP user information on the Switch.

```
sysname# show snmp-server user

[ User Information ]
Index  Name      SecurityLevel  GroupName
-----
   1   admin    noauth        admin
```

Stacking Commands

74.1 Overview

Stacking is directly connecting Switches to form a larger system that behaves as a single Switch or a virtual chassis with increased port density.

The last two SFP ports of your Switch are dedicated for Switch stacking. These are the Switches that support stacking at the time of writing.

Table 175 Switch Stacking

| MODELS WITH STACKING SUPPORT |
|------------------------------|
| XGS3700-24 |
| XGS3700-24HP |
| XGS3700-48 |
| XGS3700-48HP |



Up to 8 Switches per stack are allowed.

You can manage each Switch in the stack from a master Switch using its web configurator or console. Each Switch supports up to two stacking channels. Use the master Switch to assign a 'slot ID' for each 'linecard' non-master Switch. 'Slot' refers to a Switch in the the 'virtual chassis' stack.

You can build a Switch stack using a ring or chain topology. In a ring topology, the last Switch is connected to the first.



When you change modes, all configurations except user accounts, but including running configuration, config01 and config02 will be erased and the Switch will reboot with a new config01. Therefore, you should back up previous configurations if you want to reload them later.

Stacking will automatically choose a master Switch in a stack but you can overwrite that by actively forcing a Switch to become a master Switch using the `Stacking force-master` command. This master Switch will have the highest priority over all other stacked Switches even when they have same priority value.

If two or more Switches have `Stacking force-master` enabled, then the Switch will use `Stacking priority` to determine which is master. If they have the same `Stacking priority`, then the Switch with the longest up-time is selected. Uptime is measured in increments of 10 minutes. The Switch with the higher number of increments is selected. If they have the same uptime, then the Switch with the lowest MAC address will be the master.

This is the master election priority in a stack system:

- 1 `Stacking force-master`
- 2 Highest `Stacking priority`
- 3 Longest System Up Time
- 4 Lowest MAC Address



Master election occurs when stacking / standalone mode changes or when a stacking port is temporarily disconnected in stacking mode.

74.2 Command Summary

The following section lists the commands for this feature.

Table 176 stacking Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show stacking</code> | Shows stacking slot status. | E | 3 |
| <code>show stacking slot status</code> | Shows stacking information on each slot. | E | 3 |
| <code>show running-config</code> | Shows current Switch configuration including stacking slot summary. | E | 3 |
| <code>show stacking slot <number></code> | Shows stacking details for the specified slot. | E | 3 |
| <code>show system-information</code> | Shows Switch stacking mode. | E | 3 |
| <code>Stacking</code> | Enables stacking when the Switch is in standalone mode. The Switch will automatically reboot with a new config01. | C | 13 |
| <code>no Stacking</code> | Enables standalone when the Switch is in stacking mode. The Switch will automatically reboot with a new config01. | C | 13 |
| <code>Stacking priority <1-63></code> | Sets switch stacking priority. | C | 13 |
| <code>Stacking force-master</code> | Enables force master mode which makes this Switch the master in the stack.. | C | 13 |
| <code>no Stacking force-master</code> | Disables force master mode. | C | 13 |
| <code>Stacking slot-id <current slot-id> renumber auto</code> | Sets selected slot to auto mode. | C | 13 |

Table 176 stacking Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| Stacking slot-id <current slot-id> renumber <new slot-id> | Sets selected slot to new slot ID. | C | 13 |
| reload stacking-default | Resets all configurations done since the change to stacking mode except username and password back to the original settings. | E | 13 |

74.3 Command Examples

Use `show system-information` to show current Switch stacking mode.

```

sysname# show system-information

Product Model       : XGS3700-48HP
System Name         : XGS3700
System Mode       : Standalone
System Contact      :
System Location     :
System up Time      :      67:58:37 (e965d83 ticks)
Ethernet Address    : 00:19:cb:00:00:02
Bootbase Version    : V1.00 | 03/27/2013
ZyNOS F/W Version   : V4.20(AAGF.0)b4 | 08/12/2014
Config Boot Image   : 1
Current Boot Image  : 1
RomRasSize         : 6550116
sysname#

```

Use the following procedure to create a stack:

- 1 Select a Switch to be the master. Change its mode to stacking mode. You will see a message asking you to confirm the change. Press [Y] to confirm and the Switch will reboot automatically using a new config01.
- 2 After reboot completes, the master LED will turn on.
- 3 Force the Switch to be master, configure stacking priority to a high value, such as 63 and set its slot ID to 1.

```

sysname# configure terminal
sysname(config)# stacking
System will erase all configuration and reboot. Continue? [y/N]y
< reboot.....>

sysname(config)# stacking force-master
sysname(config)# stacking priority 63
sysname(config)# stacking slot-id 1 renumber 1

```

- 4 Change a second Switch to stacking mode and wait for it to finish rebooting automatically. This master LED will also turn on.

```
sysname# configure terminal
sysname(config)# stacking
System will erase all configuration and reboot. Continue? [y/N]y
< reboot.....>
```

- 5 Connect the two Switches using the stacking ports for the Switch defined.
- 6 The second Switch master LED will then turn off, and its **Sys** LED will blink while it's initializing. Please wait until it stops blinking, indicating that it has joined the stack.
- 7 Repeat steps 4 to 6 to connect other Switches to the stack.

Use these commands to then see the stacking status of the stack, see details of the slots in the stack and see details of an individual slot.

```

sysname# show stacking
Slot Id      Type      Status      MAC address  Role
-----
*1 XGS3700-48HP active  00:19:cb:00:00:02  master
2           -        -           -            -
3           -        -           -            -
4           -        -           -            -
5           -        -           -            -
6           -        -           -            -
7           -        -           -            -
8           -        -           -            -

Stacking Topology:Chain
sysname#
sysname# show stacking slot status
Slot      Name      Status      Up Time      Version(Running/Flash1/Flash2)
-----
*1 XGS3700-48HP active  68:20:57    V4.20 (AAGF.0)b4
                                           V4.20 (AAGF.0)b4
                                           V4.10 (AAGF.5)b1
2           inactive
3           inactive
4           inactive
5           inactive
6           inactive
7           inactive
8           inactive

sysname#
sysname# show stacking slot 1
Stacking Slot 1 Information
Stacking           : active
Role               : master
Force Master Mode  : active
Priority           : 63
Slot ID after reboot : 1
Stacking Status    : active
Master Capable     : auto
Stacking MAC Address : 00:19:cb:00:00:02
Stacking-channel 1 : down
Stacking-channel 2 : down
Stacking Up Time   : 68:19:41
ZyNOS Version
Running            : V4.20 (AAGF.0)b4
Flash 1            : V4.20 (AAGF.0)b4
Flash 2            : V4.10 (AAGF.5)b1

sysname#

```

Use these commands to see the stacking mode on a Switch.

```
sysname# show running-config
Building configuration...

Current configuration:

;; slot 1 type XGS3700-48HP
stacking force-master
vlan 1
  name 1
  fixed 1/1-1/50
  forbidden ""
  untagged 1/1-1/50
  ip address 172.23.30.223 255.255.0.0
exit
interface route-domain 172.23.30.223/16
exit
ip address 192.168.0.1 255.255.0.0
ip address default-gateway 192.168.0.254
service-control http 80 255
service-control console 255
service-control telnet 23 255
sysname#

sysname# show system-information

Product Model           : XGS3700-48HP
System Name             : XGS3700
System Mode             : Stacking
System Contact          :
System Location         :
System up Time          :    67:58:37 (e965d83 ticks)
Ethernet Address        : 00:19:cb:00:00:02
Bootbase Version        : V1.00 | 03/27/2013
ZyNOS F/W Version       : V4.20(AAGF.0)b4 | 08/12/2014
Config Boot Image       : 1
Current Boot Image      : 1
RomRasSize              : 6550116
sysname#

Copyright (c) 1994 - 2014 ZyXEL Communications Corp.
```


STP and RSTP Commands

Use these commands to configure Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP) as defined in the following standards.

- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1w Rapid Spanning Tree Protocol

See [Chapter 51 on page 198](#) and [Chapter 52 on page 201](#) for more information on MRSTP and MSTP commands respectively. See also [Chapter 43 on page 181](#) for information on loopguard commands.

75.1 Command Summary

The following section lists the commands for this feature.

Table 177 spanning-tree Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show spanning-tree config</code> | Displays Spanning Tree Protocol (STP) settings. | E | 3 |
| <code>spanning-tree mode <RSTP MRSTP MSTP></code> | Specifies the STP mode you want to implement on the Switch. | C | 13 |
| <code>spanning-tree</code> | Enables STP on the Switch. | C | 13 |
| <code>no spanning-tree</code> | Disables STP on the Switch. | C | 13 |
| <code>spanning-tree hello-time <1-10> maximum-age <6-40> forward-delay <4-30></code> | Sets Hello Time, Maximum Age and Forward Delay. hello-time: The time interval in seconds between BPDU (Bridge Protocol Data Units) configuration message generations by the root switch. maximum-age: The maximum time (in seconds) the Switch can wait without receiving a BPDU before attempting to reconfigure. forward-delay: The maximum time (in seconds) the Switch will wait before changing states. | C | 13 |
| <code>spanning-tree priority <0-61440></code> | Sets the bridge priority of the Switch. The lower the numeric value you assign, the higher the priority for this bridge. priority: Must be a multiple of 4096. | C | 13 |
| <code>spanning-tree <port-list></code> | Enables STP on a specified ports. | C | 13 |
| <code>no spanning-tree <port-list></code> | Disables STP on listed ports. | C | 13 |

Table 177 spanning-tree Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| spanning-tree <port-list> edge-port | Sets the specified ports as edge ports. This allows the port to transition to a forwarding state immediately without having to go through the listening and learning states. Note: An edge port becomes a non-edge port as soon as it receives a Bridge Protocol Data Units (BPDU). | C | 13 |
| no spanning-tree <port-list> edge-port | Sets the listed ports as non-edge ports. | C | 13 |
| spanning-tree <port-list> path-cost <1-65535> | Specifies the cost of transmitting a frame to a LAN through the port(s). It is assigned according to the speed of the bridge. | C | 13 |
| spanning-tree <port-list> priority <0-255> | Sets the priority for the specified ports. Priority decides which port should be disabled when more than one port forms a loop in a Switch. Ports with a higher priority numeric value are disabled first. | C | 13 |
| spanning-tree <port-list> rootguard | Enables root guard on the specified port in order to prevent the switch(es) attached to the port from becoming the root bridge. | C | 13 |
| no spanning-tree <port-list> rootguard | Disables root guard on a port. | C | 13 |
| spanning-tree help | Provides more information about the specified command. | C | 13 |

75.2 Command Examples

This example configures STP in the following ways:

- 1 Enables STP on the Switch.
- 2 Sets the bridge priority of the Switch to 0.
- 3 Sets the Hello Time to 4, Maximum Age to 20 and Forward Delay to 15.
- 4 Enables STP on port 5 with a path cost of 150.
- 5 Sets the priority for port 5 to 20.

```

sysname(config)# spanning-tree
sysname(config)# spanning-tree priority 0
sysname(config)# spanning-tree hello-time 4 maximum-age 20 forward-delay
--> 15
sysname(config)# spanning-tree 5 path-cost 150
sysname(config)# spanning-tree 5 priority 20

```

This example shows the current STP settings.

```

sysname# show spanning-tree config
Bridge Info:
  (a) BridgeID:                8000-001349aefb7a
  (b) TimeSinceTopoChange:     9
  (c) TopoChangeCount:        0
  (d) TopoChange:              0
  (e) DesignatedRoot:         8000-001349aefb7a
  (f) RootPathCost:           0
  (g) RootPort:                0x0000
  (h) MaxAge:                  20      (seconds)
  (i) HelloTime:               2       (seconds)
  (j) ForwardDelay:            15      (seconds)
  (k) BridgeMaxAge:            20      (seconds)
  (l) BridgeHelloTime:         2       (seconds)
  (m) BridgeForwardDelay:      15      (seconds)
  (n) TransmissionLimit:       3
  (o) ForceVersion:            2

```

The following table describes the labels in this screen.

Table 178 show spanning-tree config

| LABEL | DESCRIPTION |
|---------------------|---|
| BridgeID | This field displays the unique identifier for this bridge, consisting of bridge priority plus MAC address. |
| TimeSinceTopoChange | This field displays the time since the spanning tree was last reconfigured. |
| TopoChangeCount | This field displays the number of times the spanning tree has been reconfigured. |
| TopoChange | This field indicates whether or not the current topology is stable. 0 : The current topology is stable. 1 : The current topology is changing. |
| DesignatedRoot | This field displays the unique identifier for the root bridge, consisting of bridge priority plus MAC address. |
| RootPathCost | This field displays the path cost from the root port on this Switch to the root switch. |
| RootPort | This field displays the priority and number of the port on the Switch through which this Switch must communicate with the root of the Spanning Tree. |
| MaxAge | This field displays the maximum time (in seconds) the root switch can wait without receiving a configuration message before attempting to reconfigure. |
| HelloTime | This field displays the time interval (in seconds) at which the root switch transmits a configuration message. |
| ForwardDelay | This field displays the time (in seconds) the root switch will wait before changing states (that is, listening to learning to forwarding). |
| BridgeMaxAge | This field displays the maximum time (in seconds) the Switch can wait without receiving a configuration message before attempting to reconfigure. |
| BridgeHelloTime | This field displays the time interval (in seconds) at which the Switch transmits a configuration message. |
| BridgeForwardDelay | This field displays the time (in seconds) the Switch will wait before changing states (that is, listening to learning to forwarding). |

Table 178 show spanning-tree config (continued)

| LABEL | DESCRIPTION |
|-------------------|---|
| TransmissionLimit | This field displays the maximum number of BPDUs that can be transmitted in the interval specified by BridgeHelloTime . |
| ForceVersion | This field indicates whether BPDUs are RSTP (a value less than 3) or MSTP (a value greater than or equal to 3). |

In this example, we enable RSTP on ports 21-24. Port 24 is connected to the host while ports 21-23 are connected to another switch

```
sysname(config)# configure
sysname(config)# spanning-tree
sysname(config)# spanning-tree 21-24
sysname(config)# no spanning-tree 21-23 edge-port
```

SSH Commands

Use these commands to configure SSH on the Switch.

76.1 Command Summary

The following section lists the commands for this feature.

Table 179 ssh Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| show ssh | Displays general SSH settings. | E | 3 |
| show ssh session | Displays current SSH session(s). | E | 3 |
| show ssh known-hosts | Displays known SSH hosts information. | E | 3 |
| ssh known-hosts <host-ip> <1024 ssh-rsa ssh-dsa> <key> | Adds a remote host to which the Switch can access using SSH service. | C | 13 |
| no ssh known-hosts <host-ip> | Removes the specified remote hosts from the list of all known hosts. | C | 13 |
| no ssh known-hosts <host-ip> <1024 ssh-rsa ssh-dsa> | Removes the specified remote hosts with the specified public key (1024-bit RSA1, RSA or DSA). | C | 13 |
| show ssh key <rsa1 rsa dsa> | Displays internal SSH public and private key information. | E | 3 |
| no ssh key <rsa1 rsa dsa> | Disables the secure shell server encryption key. Your Switch supports SSH versions 1 and 2 using RSA and DSA authentication. | C | 13 |
| ssh <1 2> <[user@]dest-ip> [command </>] | Connects to an SSH server with the specified SSH version and, optionally, adds commands to be executed on the server. | E | 3 |

76.2 Command Examples

This example disables the secure shell RSA1 encryption key and removes remote hosts 172.165.1.8 and 172.165.1.9 (with an SSH-RSA encryption key) from the list of known hosts.

```
sysname(config)# no ssh key rsa1
sysname(config)# no ssh known-hosts 172.165.1.8
sysname(config)# no ssh known-hosts 172.165.1.9 ssh-rsa
```

This example shows the general SSH settings.

```

sysname# show ssh
Configuration
  Version           : SSH-1 & SSH-2 (server & client), SFTP (server)
  Server            : Enabled
  Port              : 22
  Host key bits     : 1024
  Server key bits   : 768
  Support authentication: Password
  Support ciphers   : AES, 3DES, RC4, Blowfish, CAST
  Support MACs      : MD5, SHA1
  Compression levels : 1~9

Sessions:
  Proto Serv Remote IP      Port Local IP      Port  Bytes In
Bytes Out

```

The following table describes the labels in this screen.

Table 180 show ssh

| LABEL | DESCRIPTION |
|------------------------|--|
| Configuration | |
| Version | This field displays the SSH versions and related protocols the Switch supports. |
| Server | This field indicates whether or not the SSH server is enabled. |
| Port | This field displays the port number the SSH server uses. |
| Host key bits | This field displays the number of bits in the Switch's host key. |
| Server key bits | This field displays the number of bits in the SSH server's public key. |
| Support authentication | This field displays the authentication methods the SSH server supports. |
| Support ciphers | This field displays the encryption methods the SSH server supports. |
| Support MACs | This field displays the message digest algorithms the SSH server supports. |
| Compression levels | This field displays the compression levels the SSH server supports. |
| Sessions | This section displays the current SSH sessions. |
| Proto | This field displays the SSH protocol (SSH-1 or SSH-2) used in this session. |
| Serv | This field displays the type of SSH state machine (SFTP or SSH) in this session. |
| Remote IP | This field displays the IP address of the SSH client. |
| Port | This field displays the port number the SSH client is using. |
| Local IP | This field displays the IP address of the SSH server. |
| Port | This field displays the port number the SSH server is using. |
| Bytes In | This field displays the number of bytes the SSH server has received from the SSH client. |
| Bytes Out | This field displays the number of bytes the SSH server has sent to the SSH client. |

Static Multicast Commands

Use these commands to tell the Switch how to forward specific multicast frames to specific port(s). You can also configure which to do with unknown multicast frames using the `router igmp unknown-multicast-frame` command (see [Table 77 on page 112](#)).

77.1 Command Summary

The following section lists the commands for this feature.

Table 181 multicast-forward Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show mac address-table multicast</code> | Displays the multicast MAC address table. | E | 3 |
| <code>multicast-forward name <name></code> <code>mac <mac-addr> vlan <vlan-id></code> <code>inactive</code> | Creates a new static multicast forwarding rule. The rule name can be up to 32 printable ASCII characters. <i>mac-addr</i> : Enter a multicast MAC address which identifies the multicast group. The last binary bit of the first octet pair in a multicast MAC address must be 1. For example, the first octet pair 00000001 is 01 and 00000011 is 03 in hexadecimal, so 01:00:5e:00:00:0A and 03:00:5e:00:00:27 are valid multicast MAC addresses. <i>vlan-id</i> : A VLAN identification number. Note: Static multicast addresses do not age out. | C | 13 |
| <code>multicast-forward name <name></code> <code>mac <mac-addr> vlan <vlan-id></code> <code>interface port-channel <port-list></code> | Associates a static multicast forwarding rule with specified port(s) within a specified VLAN. | C | 13 |
| <code>no multicast-forward mac <mac-addr> vlan <vlan-id></code> | Removes a specified static multicast rule. | C | 13 |
| <code>no multicast-forward mac <mac-addr> vlan <vlan-id> inactive</code> | Activates a specified static multicast rule. | C | 13 |

77.2 Command Examples

This example shows the current multicast table. The **Type** field displays **User** for rules that were manually added through static multicast forwarding or displays **System** for rules the Switch has automatically learned through IGMP snooping.

```
sysname# show mac address-table multicast
  MAC Address      VLAN ID  Type      Port
01:02:03:04:05:06  1        User      1-2
01:02:03:04:05:07  2        User      2-3
01:02:03:04:05:08  3        User      1-12
01:02:03:04:05:09  4        User      9-12
01:a0:c5:aa:aa:aa  1        System    1-12
```

This example removes a static multicast forwarding rule with multicast MAC address (01:00:5e:06:01:46) which belongs to VLAN 1.

```
sysname# no multicast-forward mac 01:00:5e:06:01:46 vlan 1
```

This example creates a static multicast forwarding rule. The rule forwards frames with destination MAC address 01:00:5e:00:00:06 to ports 10~12 in VLAN 1.

```
sysname# configure
sysname(config)# multicast-forward name AAA mac 01:00:5e:00:00:06 vlan 1
interface port-channel 10-12
```


Static Route Commands

Use these commands to tell the Switch how to forward IP traffic. IP static routes are used by layer-2 Switches to ensure they can respond to management stations not reachable via the default gateway and to proactively send traffic, for example when sending SNMP traps or conducting IP connectivity tests using ping.

Layer-3 Switches use static routes to forward traffic via gateways other than those defined as the default gateway.

78.1 Command Summary

The following section lists the commands for this feature.

Table 182 ip route Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>show ip route</code> | Displays the IP routing table. | E | 3 |
| <code>show ip route static</code> | Displays the static routes. | E | 3 |
| <code>ip ip route <ip> <mask> <next-hop-ip> [metric <metric>] [name <name>] [inactive]</code> | Creates a static route. If the <ip> <mask> already exists, the Switch deletes the existing route first. Optionally, also sets the metric, sets the name, and/or deactivates the static route. <i>metric</i> : 1-15 <i>name</i> : 1-10 English keyboard characters Note: If the <next-hop-ip> is not directly connected to the Switch, you must make the static route <i>inactive</i> . | C | 13 |
| <code>no ip route <ip> <mask></code> | Removes a specified static route. | C | 13 |
| <code>no ip route <ip> <mask> <next-hop-ip></code> | Removes a specified static route. | C | 13 |
| <code>no ip route <ip> <mask> inactive</code> | Enables a specified static route. | C | 13 |
| <code>no ip route <ip> <mask> <next-hop-ip> inactive</code> | Enables a specified static route. | C | 13 |

78.2 Command Examples

This example shows the current routing table.

```

sysname# show ip route
Dest          FF Len Device      Gateway      Metric stat Timer  Use
Route table in VPS00
172.16.37.0   00 24  swp00      172.16.37.206  1    041b 0    1494
127.0.0.0     00 16  swp00      127.0.0.1     1    041b 0     0
0.0.0.0       00 0   swp00      172.16.37.254  1    801b 0   12411
Original Global Route table

```

The following table describes the labels in this screen.

Table 183 show ip route

| LABEL | DESCRIPTION |
|---------|---|
| Dest | This field displays the destination network number. Along with Len , this field defines the range of destination IP addresses to which this entry applies. |
| FF | This field is reserved. |
| Len | This field displays the destination subnet mask. Along with Dest , this field defines the range of destination IP addresses to which this entry applies. |
| Device | This field is reserved. |
| Gateway | This field displays the IP address to which the Switch forwards packets whose destination IP address is in the range defined by Dest and Len . |
| Metric | This field displays the cost associated with this entry. |
| stat | This field is reserved. |
| Timer | This field displays the number of remaining seconds this entry remains valid. It displays 0 if the entry is always valid. |
| Use | This field displays the number of times this entry has been used to forward packets. |

In this routing table, you can create an active static route if the <next-hop-ip> is in 172.16.37.0/24 or 127.0.0.0/16. You cannot create an active static route to other IP addresses.

For example, you cannot create an active static route that routes traffic for 192.168.10.1/24 to 192.168.1.1.

```

sysname# configure
sysname(config)# ip route 192.168.10.1 255.255.255.0 192.168.1.1
Error : The Action is failed. Please re-configure setting.

```

You can create this static route if it is inactive, however.

```

sysname# configure
sysname(config)# ip route 192.168.10.1 255.255.255.0 192.168.1.1 inactive

```

You can create an active static route that routes traffic for 192.168.10.1/24 to 172.16.37.254.

```
sysname# configure
sysname(config)# ip route 192.168.10.1 255.255.255.0 172.16.37.254
sysname(config)# exit
sysname# show ip route static
```

| Idx | Active | Name | Dest. Addr. | Subnet Mask | Gateway Addr. | Metric |
|-----|--------|--------|--------------|---------------|---------------|--------|
| 01 | Y | static | 192.168.10.1 | 255.255.255.0 | 172.16.37.254 | 1 |

Subnet-based VLAN Commands

Use these commands to configure subnet-based VLANs on the Switch.

79.1 Subnet-based VLAN Overview

Subnet-based VLANs allow you to group traffic based on the source IP subnet you specify. This allows you to assign priority to traffic from the same IP subnet.

See also [Chapter 64 on page 243](#) for protocol-based VLAN commands and [Chapter 88 on page 312](#) for VLAN commands.

79.2 Command Summary

The following section lists the commands for this feature.

Table 184 subnet-based-vlan Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| show subnet-vlan | Displays subnet based VLAN settings on the Switch. | E | 3 |
| subnet-based-vlan | Enables subnet based VLAN on the Switch. | C | 13 |
| subnet-based-vlan dhcp-vlan-override | Sets the Switch to force the DHCP clients to obtain their IP addresses through the DHCP VLAN. | C | 13 |
| subnet-based-vlan name <name> source-ip <ip> mask-bits <mask-bits> vlan <vlan-id> priority <0-7> | Specifies the name, IP address, subnet mask, VLAN ID of the subnet based VLAN you want to configure along with the priority you want to assign to the outgoing frames for this VLAN. | C | 13 |
| subnet-based-vlan name <name> source-ip <ip> mask-bits <mask-bits> source-port <port> vlan <vlan-id> priority <0-7> | Specifies the name, IP address, subnet mask, source-port and VLAN ID of the subnet based VLAN you want to configure along with the priority you want to assign to the outgoing frames for this VLAN. Note: Implementation on a per port basis is not available on all models. | C | 13 |
| subnet-based-vlan name <name> source-ip <ip> mask-bits <mask-bits> vlan <vlan-id> priority <0-7> inactive | Disables the specified subnet-based VLAN. | C | 13 |
| no subnet-based-vlan | Disables subnet-based VLAN on the Switch. | C | 13 |

Table 184 subnet-based-vlan Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| no subnet-based-vlan source-ip <ip> mask-bits <mask-bits> | Removes the specified subnet from the subnet-based VLAN configuration. | C | 13 |
| no subnet-based-vlan dhcp-vlan-override | Disables the DHCP VLAN override setting for subnet-based VLAN(s). | C | 13 |

79.3 Command Examples

This example configures a subnet-based VLAN (**subnet1VLAN**) with priority **6** and a VID of **200** for traffic received from IP subnet **172.16.37.1/24**.

```

sysname# subnet-based-vlan name subnet1VLAN source-ip 172.16.37.1 mask-bits
--> 24 vlan 200 priority 6
sysname(config)# exit
sysname# show subnet-vlan

Global Active :Yes
      Name      Src IP      Mask-Bits      Vlan      Priority      Entry Active
-----
subnet1VLAN    172.16.37.1      24      200          6              1

```

Syslog Commands

Use these commands to configure the device's system logging settings and to configure the external syslog servers.

80.1 Command Summary

The following table describes user-input values available in multiple commands for this feature.

Table 185 syslog User-input Values

| COMMAND | DESCRIPTION |
|-------------|--|
| <i>type</i> | Possible values: system, interface, switch, aaa, ip. |

The following section lists the commands for this feature.

Table 186 syslog Command Summary

| COMMAND | DESCRIPTION | M | P |
|-----------|--------------------------|---|----|
| syslog | Enables syslog logging. | C | 13 |
| no syslog | Disables syslog logging. | C | 13 |

Table 187 syslog server Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| syslog server <ip-address> level <level> | Sets the IP address of the syslog server and the severity level. <i>level: 0-7</i> | C | 13 |
| no syslog server <ip-address> | Deletes the specified syslog server. | C | 13 |
| syslog server <ip-address> inactive | Disables syslog logging to the specified syslog server. | C | 13 |
| no syslog server <ip-address> inactive | Enables syslog logging to the specified syslog server. | C | 13 |

Table 188 syslog type Command Summary

| COMMAND | DESCRIPTION | M | P |
|-----------------------------------|--|---|----|
| syslog type <type> | Enables syslog logging for the specified log type. | C | 13 |
| syslog type <type> facility <0-7> | Sets the file location for the specified log type. | C | 13 |

Table 188 syslog type Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---------------------------------------|---|----------|----------|
| syslog type commands privilege <0-14> | Sets a command privilege level. The Switch will only generate logs for commands that have a privilege level greater than or equal to the specified privilege level. | C | 13 |
| no syslog type <type> | Disables syslog logging for the specified log type. | C | 13 |

PART V

Reference T-Z

TACACS+ Commands (298)
Tech Support Commands (299)
TFTP Commands (302)
Time Range Commands (303)
Trunk Commands (306)
trTCM Commands (309)
VLAN Commands (312)
VLAN IP Commands (318)
VLAN Mapping Commands (320)
VLAN Port Isolation Commands (322)
VLAN Stacking Commands (323)
VLAN Trunking Commands (326)
Voice VLAN Commands (327)
VRRP Commands (330)
Additional Commands (336)

TACACS+ Commands

Use these commands to configure external TACACS+ (Terminal Access Controller Access-Control System Plus) servers.

81.1 Command Summary

The following section lists the commands for this feature.

Table 189 tacacs-server Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| show tacacs-server | Displays TACACS+ server settings. | E | 3 |
| tacacs-server host <index> <ip> [auth-port <socket-number>] [key [cipher] <key-string>] | Specifies the IP address of the specified TACACS+ server. Optionally, sets the port number and key of the TACACS+ server. <i>index</i> : 1 or 2. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the <code>password encryption</code> command. <i>key-string</i> : 1-32 alphanumeric characters. | C | 14 |
| tacacs-server mode <index- priority round-robin> | Specifies the mode for TACACS+ server selection. | C | 14 |
| tacacs-server timeout <1-1000> | Specifies the TACACS+ server timeout value. | C | 14 |
| no tacacs-server <index> | Disables TACACS+ authentication on the specified server. | C | 14 |

Table 190 tacacs-accounting Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| show tacacs-accounting | Displays TACACS+ accounting server settings. | E | 3 |
| tacacs-accounting timeout <1- 1000> | Specifies the TACACS+ accounting server timeout value. | C | 13 |
| tacacs-accounting host <index> <ip> [acct-port <socket-number>] [key [cipher] <key-string>] | Specifies the IP address of the specified TACACS+ accounting server. Optionally, sets the port number and key of the external TACACS+ accounting server. <i>index</i> : 1 or 2. <i>cipher</i> : inform the Switch that the string after the word "cipher" is an encrypted secret. This is used in password encryption. To encrypt the password, use the <code>password encryption</code> command. <i>key-string</i> : 1-32 alphanumeric characters. | C | 13 |
| no tacacs-accounting <index> | Disables TACACS+ accounting on the specified server. | C | 13 |

Tech Support Commands

82.1 Tech-Support Overview

The Tech-Support feature is a log Enhancement tool that logs useful information such as CPU utilization history, memory and Mbuf (Memory Buffer) information and crash reports for issue analysis that's collected by customer support should you have difficulty with your Switch. The Tech Support Command Line Interface eases your effort in obtaining these reports. Type `show tech-support` command to see the log reports.

82.2 Command Summary

The following section lists the commands for this feature.

Table 191 Tech Support Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show tech-support</code> | Shows all tech-support log reports. | E | 13 |
| <code>show tech-support cpu</code> | Shows CPU history log. The log report holds 7 days of CPU log data and is stored in volatile memory (RAM). The data is lost if the Switch is turned off or in event of power outage. After 7 days, the logs wrap around and new ones and replace the earliest ones. | E | 13 |
| <code>show tech-support memory</code> | Shows the last memory session log before the Switch is turned off or in event of power outage. | E | 13 |
| <code>show tech-support mbuf</code> | Shows the mbuf that is higher than the threshold. Default mbuf value is 50. | E | 13 |
| <code>show tech-support crash</code> | Shows the last crash log before the Switch is turned off or in event of power outage. | E | 13 |
| <code>tech-support cpu <threshold> keep <time></code> | Sets the CPU threshold and time value for CPU utilization history report. Default CPU value is 80 and time 5. <i>cpu threshold</i> : a number between and including 50 and 100. <i>time</i> : a number between and including 5 to 60. | C | 13 |
| <code>tech-support mbuf <threshold></code> | Sets the Memory Buffer threshold for mbuf report. <i>mbuf threshold</i> : a number between and including 50 to 100. | C | 13 |

82.3 command examples

This example sets the mbuf threshold to 60%, checks the mbuf threshold setting and generates the mbuf log report..

```

sysname# config <cr>
sysname(config)#
sysname(config)# tech-support mbuf 60 <cr>
sysname (config)#
sysname(config)# exit <cr>
sysname# show run <cr>
sysname# Building configuration...
    Current configuration:
tech-support mbuf 60
sysname#
sysname# show tech-support mbuf
Tech-support version: v1.1
time :    0:23:18#@##### show system-information
#####msc
lock = 1398080

Product Model           : GS2210-24
System Name             : GS2210
System Contact          :
System Location         :
System up Time          :    0:23:18 (22220 ticks)
Ethernet Address        : 00:19:cb:ba:11:01
Bootbase Version        : V1.00 | 12/18/2013
ZyNOS F/W Version       : V4.10(AAND.0)20140120 | 01/20/2014
Config Boot Image      : 1
Current Boot Image     : 1
RomRasSize             : 3206408

time :    0:23:18#@##### show time
#####msc
lock = 1398090
Current Time 00:23:08 (UTC)
Current Date 1970-01-01

time :    0:23:18#@##### mbuf log
#####msclock
= 1398090
time: 1970-1-1 0:19:8
Pool ID: 0, Type: 0, used/max cnt: 19/20
8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c
8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c
8005c92c 8005c92c 8005c92c
Pool ID: 0, Type: 1, used/max cnt: 17/20
8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c
8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c 8005c92c
8005c92c
Pool ID: 0, Type: 2, used/max cnt: 3/60
8005c92c 8005c92c      0
Pool ID: 1, Type: 0, used/max cnt: 0/96
Pool ID: 1, Type: 1, used/max cnt: 0/96
Pool ID: 1, Type: 2, used/max cnt: 0/300

```

This example sets the CPU threshold to 80 and time to 5. Then uses the command `show logging` to see the log.

```
sysname# config <cr>
sysname(config)#
sysname(config)# tech-support cpu 80 keep 5 <cr>
sysname (config)#
sysname(config)# exit <cr>
sysname#
sysname# show logging
  1 Jan 01 02:52:55 IN authentication: CLI user admin login
  2 Jan 01 02:52:54 NO authentication: Console authentication failure
[username: ]
  3 Jan 01 00:01:20 NO system: System cold start
  4 Jan 01 00:01:20 AL system: System has reset without management
command
  5 Jan 01 00:01:00 IN system: CPU utilization is over 80 and keep 5
second, driver count = 0.
  6 Jan 01 00:01:00 IN system: CPU utilization is over 80 and keep 5
second, driver count = 0.
  7 Jan 01 00:01:00 IN system: CPU utilization is over 80 and keep 5
second, driver count = 0.
  8 Jan 01 00:00:55 IN authentication: CLI user admin login
  9 Jan 01 00:01:19 NO system: System cold start
 10 Jan 01 00:01:19 AL system: System has reset without management
command
 11 Jan 01 00:01:00 IN system: CPU utilization is over 80 and keep 5
second, driver count = 0.
 12 Jan 01 00:01:00 IN system: CPU utilization is over 80 and keep 5
second, driver count = 0.
 13 Jan 01 00:01:00 IN system: CPU utilization is over 80 and keep 5
second, driver count = 0.
 14 Jan 01 00:46:09 DE interface: Port 43 link down
 15 Jan 01 00:45:31 DE interface: Port 48 link down
 16 Jan 01 00:45:26 DE interface: Port 36 link down
 17 Jan 01 00:45:25 DE interface: Port 26 link down
 18 Jan 01 00:45:21 DE interface: Port 43 link up
 19 Jan 01 00:45:21 DE interface: Port 36 link up
-- more --, next page: Space, continue: c, quit: ESC
```

TFTP Commands

Use these commands to back up and restore configuration and firmware via TFTP.

83.1 Command Summary

The following section lists the commands for this feature.

Table 192 tftp Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>copy tftp flash <ip> <remote-file></code> | Restores firmware via TFTP. | E | 13 |
| <code>copy tftp config <index> <ip> <remote-file></code> | Restores configuration with the specified filename from the specified TFTP server to the specified configuration file on the Switch. <i>index</i> : 1 or 2 Use <code>reload config <1 2></code> to restart the Switch and use the restored configuration. Note: This overwrites the configuration on the Switch with the file from the TFTP server. | E | 13 |
| <code>copy tftp config merge <index> <ip> <remote-file></code> | Merges configuration with the specified filename from the specified TFTP server with the specified configuration file on the Switch. <i>index</i> : 1 or 2 Use <code>reload config <1 2></code> to restart the Switch and use the restored configuration. Note: This joins the configuration on the Switch with the one on the TFTP server, keeping the original configuration file and simply adding those parts that are different. | E | 13 |
| <code>copy running-config tftp <ip> <remote-file></code> | Backs up running configuration to the specified TFTP server with the specified file name. | E | 13 |

Time Range Commands

84.1 About Time Range

You can set a time range for time-oriented features such as Classifier ACL (Access Control List) rule which categorizes data packets into different network traffic flows. The advantage of the time range feature is that it allows you to schedule the active time of configurations. Time range can be configured in two ways - *Absolute* and *Periodic*. Absolute is a fixed time range with a start and end time. Periodic is recurrence of a time range and doesn't have an end time.

84.2 Command Summary

The following section lists the commands for this feature.

Table 193 time-range Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show time-range <name></code> | Displays details on the named rule. | C | 3 |
| <code>time-range <name> [absolute start <hh:mm> <1-31> <jan-dec> <1970-2037> end <hh:mm> <1-31> <jan-dec> <1970-2037></code> | Creates an absolute time-range rule that has a set start and end time and date (absolute). name is the name of the time-range rule. | E | 13 |
| <code>time-range <name> [periodic <[<monday tuesday wednesday thursday friday saturday sunday><hh:mm> to <monday tuesday wednesday thursday friday saturday sunday> <hh:mm>] [<[monday] [tuesday] [wednesday] [thursday] [friday] [saturday] [sunday] daily weekdays weekend> <hh:mm> to <hh:mm>]</code> | Creates a periodic time-range rule that recurs at the specified time and day (periodic). name is the name of the time-range rule. | E | 13 |
| <code>no time-range <name></code> | Removes the specified time-range rule. | C | 13 |

84.3 Command Examples

The following are some examples of using the time-range commands.

```
sysname#
sysname# configure terminal
sysname(config)# time-range work absolute start 08:00 1 jan 2015 end
17:30 31 dec 2015
sysname(config)#exit
sysname# show time-range work
    Time range work:
      Absolute start 08:00 1 January 2015 end 17:30 31 December 2015

sysname(config)# time-range work2 periodic monday 08:00 to friday 17:30
monday 08:00 to friday 17:30
sysname(config)# exit
sysname# show time-range work2
    Time range work2:
      Periodic Monday 08:00 to Friday 17:30
sysname#
```


Traceroute Commands

85.1 Traceroute Overview

Traceroute is a tool to display the path a packet takes between two endpoints.

85.2 Command Summary

The following section lists the commands for this feature.

Table 194 traceroute Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|---|
| <code>traceroute <ip host-name> [vlan <vlan-id>] [ttl <1-255>] [wait <1-60>] [queries <1-10>]</code> | Displays the path a packet takes to the specified Ethernet device with an IPv4 address. vlan <vlan-id>: Specifies the VLAN ID to which the Ethernet device belongs. ttl <1-255>: Specifies the Time To Live (TTL) period. This is to set the maximum number of the hops (routers) a packet can travel through. wait <1-60>: Specifies the time period to wait for a response to a probe before running another traceroute. queries <1-10>: Specifies how many times the Switch performs the traceroute function. | E | 0 |
| <code>traceroute help</code> | Provides more information about the specified command. | E | 0 |
| <code>traceroute6 <ipv6-addr host-name> [<ttl <1-255>] [wait <1-60>] [queries <1-10>]></code> | Displays the route a packet takes to the specified Ethernet device with an IPv6 address. vlan <vlan-id>: Specifies the VLAN ID to which the Ethernet device belongs. ttl <1-255>: Specifies the Time To Live (TTL) period. This is to set the maximum number of the hops (routers) a packet can travel through. wait <1-60>: Specifies the time period to wait for a response to a probe before running another traceroute. queries <1-10>: Specifies how many times the Switch performs the traceroute function. | E | 0 |
| <code>traceroute6 help</code> | Provides more information about the specified command. | E | 0 |

Trunk Commands

Use these commands to logically aggregate physical links to form one logical, higher-bandwidth link. The Switch adheres to the IEEE 802.3ad standard for static and dynamic (Link Aggregate Control Protocol, LACP) port trunking.



Different models support different numbers of trunks (T1, T2, ...). This chapter uses a model that supports six trunks (from T1 to T6).

86.1 Command Summary

The following section lists the commands for this feature.

Table 195 trunk Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show trunk</code> | Displays link aggregation information. | E | 3 |
| <code>trunk <T1 T2 T3 T4 T5 T6></code> | Activates a trunk group. | C | 13 |
| <code>no trunk <T1 T2 T3 T4 T5 T6></code> | Disables the specified trunk group. | C | 13 |
| <code>trunk <T1 T2 T3 T4 T5 T6> criteria <src-mac dst-mac src- dst-mac src-ip dst-ip src-dst- ip></code> | Sets the traffic distribution type used for the specified trunk group. | C | 13 |
| <code>no trunk <T1 T2 T3 T4 T5 T6> criteria</code> | Returns the traffic distribution type used for the specified trunk group to the default (<code>src-dst-mac</code>). | C | 13 |
| <code>trunk <T1 T2 T3 T4 T5 T6> interface <port-list></code> | Adds a port(s) to the specified trunk group. | C | 13 |
| <code>no trunk <T1 T2 T3 T4 T5 T6> interface <port-list></code> | Removes ports from the specified trunk group. | C | 13 |
| <code>trunk <T1 T2 T3 T4 T5 T6> lacp</code> | Enables LACP for a trunk group. | C | 13 |
| <code>no trunk <T1 T2 T3 T4 T5 T6> lacp</code> | Disables LACP in the specified trunk group. | C | 13 |
| <code>trunk interface <port-list> timeout <lacp-timeout></code> | Defines LACP timeout period (in seconds) for the specified port(s). <i>lacp-timeout: 1 or 30</i> | C | 13 |

Table 196 lacp Command Summary

| COMMAND | DESCRIPTION | M | P |
|--------------------------------|--|---|----|
| show lacp | Displays LACP (Link Aggregation Control Protocol) settings. | E | 3 |
| lacp | Enables Link Aggregation Control Protocol (LACP). | C | 13 |
| no lacp | Disables the link aggregation control protocol (dynamic trunking) on the Switch. | C | 13 |
| lacp system-priority <1-65535> | Sets the priority of an active port using LACP. | C | 13 |

86.2 Command Examples

This example activates trunk 1 and places ports 5-8 in the trunk using static link aggregation.

```
sysname(config)# trunk t1
sysname(config)# trunk t1 interface 5-8
```

This example disables trunk one (T1) and removes ports 1, 3, 4, and 5 from trunk two (T2).

```
sysname(config)# no trunk T1
sysname(config)# no trunk T2 interface 1,3-5
```

This example looks at the current trunks.

```
sysname# show trunk
Group ID 1:      inactive
  Status: -
  Member number: 0
Group ID 2:      inactive
  Status: -
  Member number: 0
Group ID 3:      inactive
  Status: -
  Member number: 0
```

The following table describes the labels in this screen.

Table 197 show trunk

| LABEL | DESCRIPTION |
|----------|---|
| Group ID | This field displays the trunk ID number and the current status. inactive: This trunk is disabled. active: This trunk is enabled. |
| Status | This field displays how the ports were added to the trunk. -: The trunk is disabled. Static: The ports are static members of the trunk. LACP: The ports joined the trunk via LACP. |

Table 197 show trunk (continued)

| LABEL | DESCRIPTION |
|---------------|--|
| Member Number | This field shows the number of ports in the trunk. |
| Member | This field is displayed if there are ports in the trunk. This field displays the member port(s) in the trunk. |

This example shows the current LACP settings.

```

sysname# show lacp
AGGREGATOR INFO:
ID: 1
  [(0000,00-00-00-00-00-00,0000,00,0000)] [(0000,00-00-00-00-00-00
-->,0000,00,0000)]
LINKS :
SYNCS :

ID: 2
  [(0000,00-00-00-00-00-00,0000,00,0000)] [(0000,00-00-00-00-00-00
-->,0000,00,0000)]
LINKS :
SYNCS :

ID: 3
  [(0000,00-00-00-00-00-00,0000,00,0000)] [(0000,00-00-00-00-00-00
-->,0000,00,0000)]
LINKS :
SYNCS :

```

The following table describes the labels in this screen.

Table 198 show lacp

| LABEL | DESCRIPTION |
|--|--|
| ID | This field displays the trunk ID to identify a trunk group, that is, one logical link containing multiple ports. |
| [(0000,00-00-00-00-00-00-00,0000,00,0000)] | This field displays the system priority, MAC address, key, port priority, and port number. |
| LINKS | In some switches this displays the ports whose link state are up. In other switches this displays the ports which belong to this trunk group. |
| SYNCS | These are the ports that are currently transmitting data as one logical link in this trunk group. |

trTCM Commands

This chapter explains how to use commands to configure the Two Rate Three Color Marker (trTCM) feature on the Switch.

87.1 trTCM Overview

Two Rate Three Color Marker (trTCM, defined in RFC 2698) is a type of traffic policing that identifies packets by comparing them to two user-defined rates: the Committed Information Rate (CIR) and the Peak Information Rate (PIR). trTCM then tags the packets:

- red - if the packet exceeds the PIR
- yellow - if the packet is below the PIR, but exceeds the CIR
- green - if the packet is below the CIR

The colors reflect the packet's loss priority and the Switch changes the packet's DiffServ Code Point (DSCP) value based on the color.

87.2 Command Summary

The following section lists the commands for this feature.

Table 199 trtcm Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| trtcm | Enables trTCM on the Switch. | C | 13 |
| trtcm mode <color-aware color-blind> | Sets the mode for trTCM on the Switch. | C | 13 |
| no trtcm | Disables trTCM feature on the Switch. | C | 13 |
| no trtcm dscp profile <name> | Removes the specified DSCP profile. | C | 13 |
| trtcm dscp profile <name> dscp green <0-63> yellow <0-63> red <0-63> | Configures a DSCP profile to specify the DSCP values that you want to assign to packets based on the color they are marked via trTCM | C | 13 |
| show interfaces config <port-list> trtcm dscp profile | Displays DSCP profile settings on the specified port(s). | E | 3 |
| show trtcm dscp profile | Displays all DSCP profiles settings on the Switch. | E | 3 |
| interface port-channel <port-list> | Enters subcommand mode for configuring the specified ports. | C | 13 |
| trtcm | Enables trTCM on the specified port(s). | C | 13 |

Table 199 trtcm Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---------------------------|---|---|----|
| no trtcm | Disables trTCM on the port(s). | C | 13 |
| trtcm cir <rate> | Sets the Commit Information Rate on the port(s). | C | 13 |
| trtcm pir <rate> | Sets the Peak Information Rate on the port(s). | C | 13 |
| trtcm dscp green <0-63> | Specifies the DSCP value to use for packets with low packet loss priority. | C | 13 |
| trtcm dscp yellow <0-63> | Specifies the DSCP value to use for packets with medium packet loss priority. | C | 13 |
| trtcm dscp red <0-63> | Specifies the DSCP value to use for packets with high packet loss priority. | C | 13 |
| trtcm dscp profile <name> | Specifies the DSCP profile that you want to apply to packets on the port(s). | C | 13 |
| no trtcm dscp profile | Sets the Switch to apply the default DSCP profile to packets on the port(s). | C | 13 |

87.3 Command Examples

This example activates trTCM on the Switch with the following settings:

- Sets the Switch to inspect the DSCP value of packets (color-aware mode).
- Enables trTCM on ports 1-5.
- Sets the Committed Information Rate (CIR) to 4000 Kbps.
- Sets the Peak Information Rate (PIR) to 4500 Kbps.
- Specifies DSCP value 7 for green packets, 22 for yellow packets and 44 for red packets.

```

sysname(config)# trtcm
sysname(config)# trtcm mode color-aware
sysname(config)# interface port-channel 1-5
sysname(config-interface)# trtcm
sysname(config-interface)# trtcm cir 4000
sysname(config-interface)# trtcm pir 4500
sysname(config-interface)# trtcm dscp green 7
sysname(config-interface)# trtcm dscp yellow 22
sysname(config-interface)# trtcm dscp red 44
sysname(config-interface)# exit
sysname(config)# exit
sysname# show running-config interface port-channel 1 trtcm
  Building configuration...

  Current configuration:
interface port-channel 1
  trtcm
  trtcm cir 4000
  trtcm pir 4500
  trtcm dscp green 7
  trtcm dscp yellow 22
  trtcm dscp red 44
exit

```

This examples activates trTCM on the Switch with the following settings :

- Enable trTCM on the Switch
- Enable Diffserv on the Switch
- Set the Switch to inspect the DSCP value of packets (color-aware mode)
- Create a trTCM DSCP profile with the name “abc”, and set DSCP value 1 for green packets, 2 for yellow packets, 3 for red packets
- Associate the profile “abc” with port 1
- Enable trTCM on port 1
- Enable Diffserv on port 1
- Set the Committed Information Rate (CIR) to 4000 Kpbs
- Set the Peak Information Rate (PIR) to 4500 Kbps
- Display the settings of this example

```

sysname# config
sysname(config)# trtcm
sysname(config)# diffserv
sysname(config)# trtcm mode color-aware
sysname(config)# trtcm dscp profile abc dscp green 1 yellow 2 red 3
sysname(config)# interface port-channel 1
sysname(config-interface)# trtcm
sysname(config-interface)# diffserv
sysname(config-interface)# trtcm dscp profile abc
sysname(config-interface)# trtcm cir 4000
sysname(config-interface)# trtcm pir 4500
sysname(config-interface)# exit
sysname(config)# exit
sysname # show running-config
  Building configuration...

  Current configuration:

vlan 1
  name 1
  normal ""
  fixed 1-28
  forbidden ""
  untagged 1-28
  ip address default-management 192.168.1.1 255.255.255.0
exit
trtcm
trtcm mode color-aware
trtcm dscp profile abc dscp green 1 yellow 2 red 3
interface port-channel 1
  diffserv
  trtcm
  trtcm cir 4000
  trtcm pir 4500
  trtcm dscp profile abc
exit
diffserv
sysname #

```

VLAN Commands

Use these commands to configure IEEE 802.1Q VLAN.



See [Chapter 89 on page 318](#) for VLAN IP commands.

88.1 VLAN Overview

A VLAN (Virtual Local Area Network) allows a physical network to be partitioned into multiple logical networks. Devices on a logical network belong to one group. A device can belong to more than one group. With VLAN, a device cannot directly talk to or hear from devices that are not in the same group(s); the traffic must first go through a router.



VLAN is unidirectional; it only governs outgoing traffic.

88.2 VLAN Configuration Overview

- 1 Use the `vlan <vlan-id>` command to configure or create a VLAN on the Switch. The Switch automatically enters `config-vlan` mode. Use the `exit` command when you are finished configuring the VLAN.
- 2 Use the `interface port-channel <port-list>` command to set the VLAN settings on a port. The Switch automatically enters `config-interface` mode. Use the `pvid <vlan-id>` command to set the VLAN ID you created for the port-list in the PVID table. Use the `exit` command when you are finished configuring the ports.

```
sysname (config)# vlan 2000
sysname (config-vlan)# name up1
sysname (config-vlan)# fixed 5-8
sysname (config-vlan)# no untagged 5-8
sysname (config-vlan)# exit
sysname (config)# interface port-channel 5-8
sysname (config-interface)# pvid 2000
sysname (config-interface)# exit
```




See [Chapter 33 on page 124](#) for interface port-channel commands.

88.3 Command Summary

The following section lists the commands for this feature.

Table 200 vlan Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| show vlan | Displays the status of all VLANs. | E | 3 |
| show vlan <vlan-id> | Displays the status of the specified VLAN. | E | 3 |
| show vlan <vlan-id> counters | Displays concurrent incoming packet statistics of the specified VLAN and refreshes every 10 seconds until you press the [ESC] button. | E | 3 |
| show vlan <vlan-id> interface port-channel <port-num> counters | Displays concurrent incoming packet statistics of the specified port in the specified VLAN and refreshes every 10 seconds until you press the [ESC] button. | E | 3 |
| vlan-type <802.1q port-based> | Specifies the VLAN type. | C | 13 |
| vlan <vlan-id> | Enters config-vlan mode for the specified VLAN. Creates the VLAN, if necessary. | C | 13 |
| fixed <port-list> | Specifies the port(s) to be a permanent member of this VLAN group. | C | 13 |
| no fixed <port-list> | Sets fixed port(s) to normal port(s). | C | 13 |
| forbidden <port-list> | Specifies the port(s) you want to prohibit from joining this VLAN group. | C | 13 |
| no forbidden <port-list> | Sets forbidden port(s) to normal port(s). | C | 13 |
| inactive | Disables the specified VLAN. | C | 13 |
| no inactive | Enables the specified VLAN. | C | 13 |
| name <name> | Specifies a name for identification purposes. <i>name:</i> 1-64 English keyboard characters | C | 13 |
| normal <port-list> | Specifies the port(s) to dynamically join this VLAN group using GVRP | C | 13 |
| untagged <port-list> | Specifies the port(s) you don't want to tag all outgoing frames transmitted with this VLAN Group ID. | C | 13 |
| no untagged <port-list> | Specifies the port(s) you want to tag all outgoing frames transmitted with this VLAN Group ID. | C | 13 |
| no vlan <vlan-id> | Deletes a VLAN. | C | 13 |

The following section lists the commands for the ingress checking feature



VLAN ingress checking implementation differs across Switch models.

- Some models enable or disable VLAN ingress checking on all the ports via the `vlan1q ingress-check` command.
- Other models enable or disable VLAN ingress checking on each port individually via the `ingress-check` command in the config-interface mode.

Table 201 vlan1q ingress-check Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>show vlan1q ingress-check</code> | Displays ingress check settings on the Switch. | E | 3 |
| <code>vlan1q ingress-check</code> | Enables ingress checking on the Switch. The Switch discards incoming frames on a port for VLANs that do not include this port in its member set. | C | 13 |
| <code>no vlan1q ingress-check</code> | Disables ingress checking on the Switch. | C | 13 |

Table 202 ingress-check Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>ingress-check</code> | Enables ingress checking on the specified ports. The Switch discards incoming frames for VLANs that do not include this port in its member set. | C | 13 |
| <code>no ingress-check</code> | Disables ingress checking on the specified ports. | C | 13 |

88.4 Command Examples

This example configures ports 1 to 5 as fixed and untagged ports in VLAN 2000.

```
sysname (config)# vlan 2000
sysname (config-vlan)# fixed 1-5
sysname (config-vlan)# untagged 1-5
```

This example deletes entry 2 in the static VLAN table.

```
sysname (config)# no vlan 2
```

This example shows the VLAN table.

```
sysname# show vlan
The Number of VLAN:    3
Idx. VID  Status    Elap-Time    TagCtl
-----
 1    1    Static    0:12:13    Untagged :1-2
                   Tagged   :
 2   100    Static    0:00:17    Untagged :
                   Tagged   :1-4
 3   200    Static    0:00:07    Untagged :1-2
                   Tagged   :3-8
```

The following table describes the labels in this screen.

Table 203 show vlan

| LABEL | DESCRIPTION |
|--------------------|---|
| The Number of VLAN | This field displays the number of VLANs on the Switch. |
| Idx. | This field displays an entry number for each VLAN. |
| VID | This field displays the VLAN identification number. |
| Status | This field displays how this VLAN was added to the Switch. Dynamic: The VLAN was added via GVRP. Static: The VLAN was added as a permanent entry Other: The VLAN was added in another way, such as Multicast VLAN Registration (MVR). |
| Elap-Time | This field displays how long it has been since a dynamic VLAN was registered or a static VLAN was set up. |
| TagCtl | This field displays untagged and tagged ports. Untagged: These ports do not tag outgoing frames with the VLAN ID. Tagged: These ports tag outgoing frames with the VLAN ID. |

This example enables ingress checking on ports 1-5.

```
sysname (config)# interface port-channel 1-5
sysname (config-vlan)# ingress-check
```

This example displays concurrent incoming packet statistics for VLAN 1.

```

MGS-3712# show vlan 1 counters
----- Press ESC to finish -----
System up time:      0:59:02
Vlan Info      Vlan Id.          :1
Packet        KBs/s            :0.0
               Packets           :2
               Multicast          :0
               Broadcast          :2
               Tagged             :0
Distribution   64              :2
               65 to 127         :0
               128 to 255        :0
               256 to 511        :0
               512 to 1023       :0
               1024 to 1518     :0
               Giant             :0

----- Press ESC to finish -----
System up time:      0:59:12
Vlan Info      Vlan Id.          :1
Packet        KBs/s            :0.384
               Packets           :10
               Multicast          :0
               Broadcast          :10
               Tagged             :0
Distribution   64              :10
               65 to 127         :0
               128 to 255        :0
               256 to 511        :0
               512 to 1023       :0
               1024 to 1518     :0
               Giant             :0

```

The following table describes the labels in this screen.

Table 204 show vlan counters

| LABEL | DESCRIPTION |
|----------------|---|
| System up time | This field shows the total amount of time the connection has been up. |
| VLAN Info | This field displays the VLAN ID you are viewing. |
| Packet | |
| KBs/s | This field shows the number kilobytes per second flowing through this VLAN. |
| Packets | This field shows the number of good packets (unicast, multicast and broadcast) flowing through this VLAN. |
| Multicast | This field shows the number of good multicast packets flowing through this VLAN. |
| Broadcast | This field shows the number of good broadcast packets flowing through this VLAN. |
| Tagged | This field shows the number of VLAN-tagged packets flowing through this VLAN. |
| Distribution | |

Table 204 show vlan counters (continued)

| LABEL | DESCRIPTION |
|-----------|--|
| 64 | This field shows the number of packets (including bad packets) received that were 64 octets in length. |
| 65-127 | This field shows the number of packets (including bad packets) received that were between 65 and 127 octets in length. |
| 128-255 | This field shows the number of packets (including bad packets) received that were between 128 and 255 octets in length. |
| 256-511 | This field shows the number of packets (including bad packets) received that were between 256 and 511 octets in length. |
| 512-1023 | This field shows the number of packets (including bad packets) received that were between 512 and 1023 octets in length. |
| 1024-1518 | This field shows the number of packets (including bad packets) received that were between 1024 and 1518 octets in length. |
| Giant | This field shows the number of packets (including bad packets) received that were between 1519 octets and the maximum frame size. The maximum frame size varies depending on your switch model. See Product Specification chapter in your User's Guide. |

VLAN IP Commands

Use these commands to configure the default gateway device and add IP domains for VLAN.

89.1 IP Interfaces Overview

The Switch needs an IP address for it to be managed over the network. The factory default IP address is 192.168.1.1. The subnet mask specifies the network number portion of an IP address. The factory default subnet mask is 255.255.255.0.

89.2 Command Summary

The following section lists the commands for this feature.

Table 205 vlan ip address Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>show vlan <vlan-id></code> | Displays the status of the specified VLAN. | E | 3 |
| <code>vlan <1-4094></code> | Enters config-vlan mode for the specified VLAN. Creates the VLAN, if necessary. | C | 13 |
| <code>ip address default-management dhcp-bootp</code> | Configures the Switch to get the in-band management IP address from a DHCP server. | C | 13 |
| <code>no ip address default-management dhcp-bootp</code> | Configures the Switch to use the static in-band management IP address. The Switch uses the default IP address of 192.168.1.1 if you do not configure a static IP address. | C | 13 |
| <code>ip address default-management <ip-address> <mask></code> | Sets and enables the in-band management IP address and subnet mask. | C | 13 |
| <code>ip address default-management dhcp-bootp release</code> | Releases the in-band management IP address provided by a DHCP server. | C | 13 |
| <code>ip address default-management dhcp-bootp renew</code> | Updates the in-band management IP address provided by a DHCP server. | C | 13 |
| <code>ip address <ip-address> <mask></code> | Sets the IP address and subnet mask of the Switch in the specified VLAN. | C | 13 |
| <code>ip address <ip-address> <mask> manageable</code> | Sets the IP address and subnet mask of the Switch in the specified VLAN. Some switch models require that you execute this command to ensure that remote management via HTTP, Telnet or SNMP is activated. | C | 13 |
| <code>no ip address <ip-address> <mask></code> | Deletes the IP address and subnet mask from this VLAN. | C | 13 |

Table 205 vlan ip address Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>ip address default-gateway <ip-address></code> | Sets a default gateway IP address for this VLAN. | C | 13 |
| <code>no ip address default-gateway</code> | Deletes the default gateway from this VLAN. | C | 13 |

89.3 Command Examples

See [Section 3.4 on page 20](#) for an example of how to configure a VLAN management IP address

VLAN Mapping Commands

Use these commands to configure VLAN mapping on the Switch. With VLAN mapping enabled, the Switch can map the VLAN ID and priority level of packets received from a private network to those used in the service provider's network. The Switch discards the tagged packets that do not match an entry in the VLAN mapping table.



You can not enable VLAN mapping and VLAN stacking at the same time.

90.1 Command Summary

The following section lists the commands for this feature.

Table 206 vlan mapping Command Summary

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>no vlan-mapping</code> | Disables VLAN mapping on the Switch. | C | 13 |
| <code>no vlan-mapping interface port-channel <port> vlan <1-4094></code> | Removes the specified VLAN mapping rule. | C | 13 |
| <code>no vlan-mapping interface port-channel <port> vlan <1-4094> inactive</code> | Enables the specified VLAN mapping rule. | C | 13 |
| <code>vlan-mapping</code> | Enables VLAN mapping on the Switch. | C | 13 |
| <code>vlan-mapping name <name> interface port-channel <port> vlan <1-4094> translated-vlan <1-4094> priority <0-7></code> | Creates a VLAN mapping rule. | C | 13 |
| <code>vlan-mapping name <name> interface port-channel <port> vlan <1-4094> translated-vlan <1-4094> priority <0-7> inactive</code> | Disables the specified VLAN mapping rule. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>vlan-mapping</code> | Enables VLAN mapping on the port(s). | C | 13 |
| <code>no vlan-mapping</code> | Disables VLAN mapping on the port(s). | C | 13 |

90.2 Command Examples

This example enables VLAN mapping on the Switch and creates a VLAN mapping rule to translate the VLAN ID from 123 to 234 in the packets received on port 4.

```
sysname# configure
sysname(config)# vlan-mapping
sysname(config)# vlan-mapping name test interface port-channel 4 vlan 123
translated-vlan 234 priority 3
sysname(config)#
```

This example enables VLAN mapping on port 4.

```
sysname# configure
sysname(config)# interface port-channel 4
sysname(config-interface)# vlan-mapping
sysname(config-interface)# exit
sysname(config)#
```

VLAN Port Isolation Commands

Use these commands to configure VLAN port isolation on the Switch. VLAN port isolation allows each port to communicate only with the CPU management port and the uplink ports, but not to communicate with each other.

91.1 Command Summary

The following section lists the commands for this feature.

Table 207 vlan1q port-isolation Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>show vlan1q port-isolation</code> | Displays port isolation settings. | E | 3 |
| <code>vlan1q port-isolation</code> | Enables VLAN port isolation. | C | 13 |
| <code>no vlan1q port-isolation</code> | Disables VLAN port isolation. | C | 13 |
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>no vlan1q port-isolation</code> | Enables VLAN port isolation on the port(s). | C | 13 |
| <code>vlan1q port-isolation</code> | Disables VLAN port isolation on the port(s). | C | 13 |

VLAN Stacking Commands

Use these commands to add an outer VLAN tag to the inner IEEE 802.1Q tagged frames that enter your network.

92.1 Command Summary

The following section lists the commands for this feature.

Table 208 vlan-stacking Command Summary

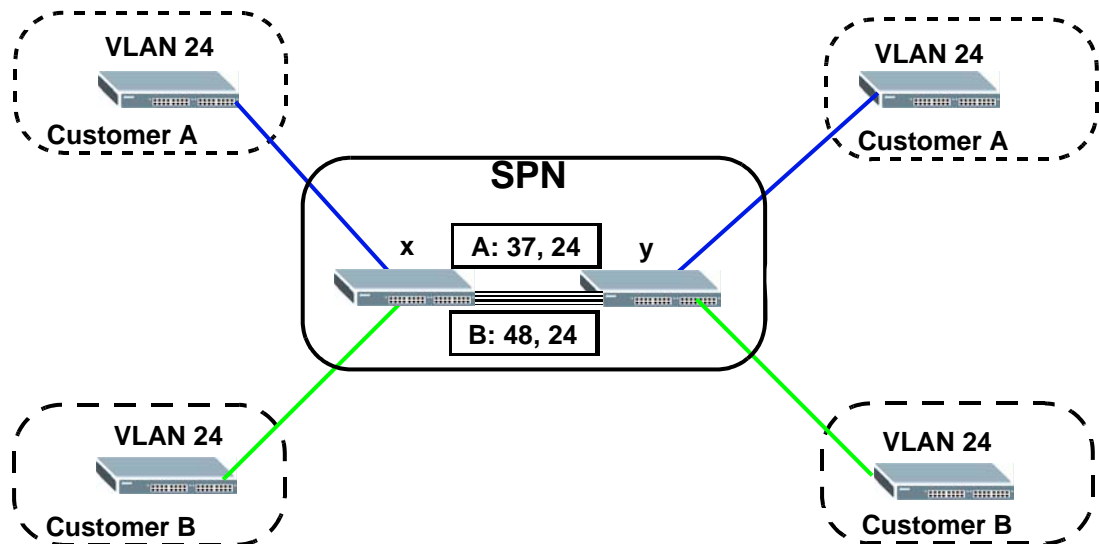
| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code> vlan-stacking priority <0-7></code> | Sets the priority of the specified port(s) in port-based VLAN stacking. | C | 13 |
| <code> vlan-stacking role <normal access tunnel></code> | Sets the VLAN stacking port roles of the specified port(s). <i>normal</i> : The Switch ignores frames received (or transmitted) on this port with VLAN stacking tags. <i>access</i> : the Switch adds the SP TPID tag to all incoming frames received on this port. <i>tunnel</i> : (available for Gigabit and faster ports only) for egress ports at the edge of the service provider's network. Note: In order to support VLAN stacking on a port, the port must be able to allow frames of 1526 Bytes (1522 Bytes + 4 Bytes for the second tag) to pass through it. | C | 13 |
| <code> vlan-stacking SPVID <1-4094></code> | Sets the service provider VID of the specified port(s). | C | 13 |
| <code> vlan-stacking tunnel-tpid <tpid></code> | Sets a four-digit hexadecimal number from 0000 to FFFF that the Switch adds in the outer VLAN tag of the outgoing frames sent on the tunnel port(s). | C | 13 |
| <code>no vlan-stacking</code> | Disables VLAN stacking on the Switch. | C | 13 |
| <code>no vlan-stacking selective-qinq interface port-channel <port> cvid <vlan-id></code> | Removes the specified selective VLAN stacking rule. | C | 13 |
| <code>no vlan-stacking selective-qinq interface port-channel <port> cvid <vlan-id> inactive</code> | Enables the specified selective VLAN stacking rule. | C | 13 |
| <code>show vlan-stacking</code> | Displays VLAN stacking settings. | E | 3 |
| <code>vlan-stacking</code> | Enables VLAN stacking on the Switch. | C | 13 |

Table 208 vlan-stacking Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>vlan-stacking <sptpid></code> | Sets the SP TPID (Service Provider Tag Protocol Identifier). SP TPID is a standard Ethernet type code identifying the frame and indicating whether the frame carries IEEE 802.1Q tag information. Enter a four-digit hexadecimal number from 0000 to FFFF. | C | 13 |
| <code>vlan-stacking selective-qinq name <name> interface port-channel <port> cvid <cvid> spvid <spvid> priority <0-7></code> | Creates a selective VLAN stacking rule. <i>cvid</i> : 1 - 4094. This is the VLAN tag carried in the packets from the subscribers. <i>spvid</i> : 1 - 4094: This is the service provider's VLAN ID (the outer VLAN tag). | C | 13 |
| <code>vlan-stacking selective-qinq name <name> interface port-channel <port> cvid <cvid> spvid <spvid> priority <0-7> inactive</code> | Disables the specified selective VLAN stacking rule. | C | 13 |

92.2 Command Examples

In the following example figure, both **A** and **B** are Service Provider's Network (SPN) customers with VPN tunnels between their head offices and branch offices respectively. Both have an identical VLAN tag for their VLAN group. The service provider can separate these two VLANs within its network by adding tag **37** to distinguish customer **A** and tag **48** to distinguish customer **B** at edge device **x** and then stripping those tags at edge device **y** as the data frames leave the network.

Figure 10 Example: VLAN Stacking

This example shows how to configure ports 1 and 2 on the Switch to tag incoming frames with the service provider's VID of 37 (ports are connected to customer A network). This example also shows how to set the priority for ports 1 and 2 to 3.

```
sysname(config)# vlan-stacking
sysname(config)# interface port-channel 1-2
sysname(config-interface)# vlan-stacking role access
sysname(config-interface)# vlan-stacking spvid 37
sysname(config-interface)# vlan-stacking priority 3
sysname(config-interface)# exit
sysname(config)# exit
sysname# show vlan-stacking
Switch Vlan Stacking Configuration
Operation: active
STPID: 0x8100
```

| Port | Role | SPVID | Priority |
|------|--------|-------|----------|
| 01 | access | 37 | 3 |
| 02 | access | 37 | 3 |
| 03 | access | 1 | 0 |
| 04 | access | 1 | 0 |
| 05 | access | 1 | 0 |
| 06 | access | 1 | 0 |
| 07 | access | 1 | 0 |
| 08 | access | 1 | 0 |
| | | | |

VLAN Trunking Commands

Use these commands to decide what the Switch should do with frames that belong to unknown VLAN groups.

93.1 Command Summary

The following section lists the commands for this feature.

Table 209 vlan-trunking Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>interface port-channel <port-list></code> | Enters config-interface mode for the specified port(s). | C | 13 |
| <code>vlan-trunking</code> | Enables VLAN trunking on ports connected to other switches or routers (but not ports directly connected to end users). This allows frames belonging to unknown VLAN groups to go out via the VLAN-trunking port. | C | 13 |
| <code>no vlan-trunking</code> | Disables VLAN trunking on the port(s). | C | 13 |

Voice VLAN Commands

Use these commands to set up Voice VLAN on the Switch.

94.1 Voice VLAN Overview

Voice VLAN ensures that the sound quality of an IP phone is preserved from deteriorating when the data traffic on the Switch ports is high. It groups the voice traffic with defined priority into an assigned VLAN which enables the separation of voice and data traffic coming onto the Switch port.

You can set priority level to the Voice VLAN and add MAC address of IP phones from specific manufacturers by using its ID from the Organizationally Unique Identifiers (OUI).

See below commands and examples to set up the Voice VLAN.

94.2 Command Summary

The following section lists the commands for this feature.

Table 210 Voice VLAN Command Summary

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>voice-vlan <vlan-id></code> | Sets the Voice VLAN ID. | C | 13 |
| <code>voice-vlan priority <0-7></code> | Sets the Voice VLAN priority level. | C | 13 |
| <code>voice-vlan oui <mac-addr> mask <mask-addr> description <description></code> | Sets the Voice VLAN device's OUI address, mask address and device manufacturer description.. | C | 13 |
| <code>no voice-vlan</code> | Disables Voice VLAN configuration. | C | 13 |
| <code>no voice-vlan oui <mac-addr> mask <mask-addr></code> | Removes the OUI from the Voice VLAN. | C | 13 |
| <code>show voice-vlan</code> | Show Voice VLAN status. | E | 3 |

94.3 Command Example

This example configures Voice VLAN to port number 5, priority level number 6 and displays Voice VLAN session.

```
sysname# configure
sysname(config)# voice-vlan 5
sysname(config)# voice-vlan priority 6
sysname(config)# exit
sysname# show voice-vlan
Voice VLAN      : enable
VLAN ID         : 5
Priority        : 6
Port           Mode      Tagging      VLAN Membership
1             normal   tagged       no
2             normal   tagged       no
3             normal   tagged       no
4             normal   tagged       no
5             normal   tagged       no
6             normal   tagged       no
7             normal   tagged       no
8             normal   tagged       no
9             normal   tagged       no
10            normal   tagged       no
11            fixed    tagged       yes
12            fixed    tagged       yes
13            fixed    tagged       yes
14            fixed    tagged       yes
15            fixed    tagged       yes
16            fixed    tagged       yes
17            fixed    tagged       yes
18            fixed    tagged       yes
19            fixed    tagged       yes
20            fixed    tagged       yes
21 forbidden   tagged       no
22 forbidden   tagged       no
23 forbidden   tagged       no
24 forbidden   tagged       no
25 forbidden   tagged       no
26 forbidden   tagged       no
27 forbidden   tagged       no
28 forbidden   tagged       no
```


This example sets the VLAN ports for Voice VLAN as seen in the above example. Normal port is 5 to 10, Fixed port is 11 to 20 and forbidden port is 21 to 28. Port numbers can be higher if the Switch model has 48 ports.

```

sysname# configure
sysname(config)# vlan 5
sysname(config-vlan)# normal 5-10
sysname(config-vlan)# fixed 11-20
sysname(config-vlan)# forbidden 21-28
sysname(config-vlan)# exit
sysname# show voice-vlan
Voice VLAN      : enable
VLAN ID        : 5
Priority        : 6

```

| Port | Mode | Tagging | VLAN Membership |
|------|-----------|---------|-----------------|
| 1 | normal | tagged | no |
| 2 | normal | tagged | no |
| 3 | normal | tagged | no |
| 4 | normal | tagged | no |
| 5 | normal | tagged | no |
| 6 | normal | tagged | no |
| 7 | normal | tagged | no |
| 8 | normal | tagged | no |
| 9 | normal | tagged | no |
| 10 | normal | tagged | no |
| 11 | fixed | tagged | yes |
| 12 | fixed | tagged | yes |
| 13 | fixed | tagged | yes |
| 14 | fixed | tagged | yes |
| 15 | fixed | tagged | yes |
| 16 | fixed | tagged | yes |
| 17 | fixed | tagged | yes |
| 18 | fixed | tagged | yes |
| 19 | fixed | tagged | yes |
| 20 | fixed | tagged | yes |
| 21 | forbidden | tagged | no |
| 22 | forbidden | tagged | no |
| 23 | forbidden | tagged | no |
| 24 | forbidden | tagged | no |
| 25 | forbidden | tagged | no |
| 26 | forbidden | tagged | no |
| 27 | forbidden | tagged | no |
| 28 | forbidden | tagged | no |

VRRP Commands

This chapter explains how to use commands to configure the Virtual Router Redundancy Protocol (VRRP) on the Switch.

95.1 VRRP Overview

VRRP is a protocol that allows you to configure redundant router connections. The protocol reduces downtime in case of a single link failure. Multiple routers are connected and one is elected as the master router. If the master router fails, then one of the backup routers takes over the routing function within a routing domain.

95.2 Command Summary

The following section lists the commands for this feature.

Table 211 VRRP Command Summary

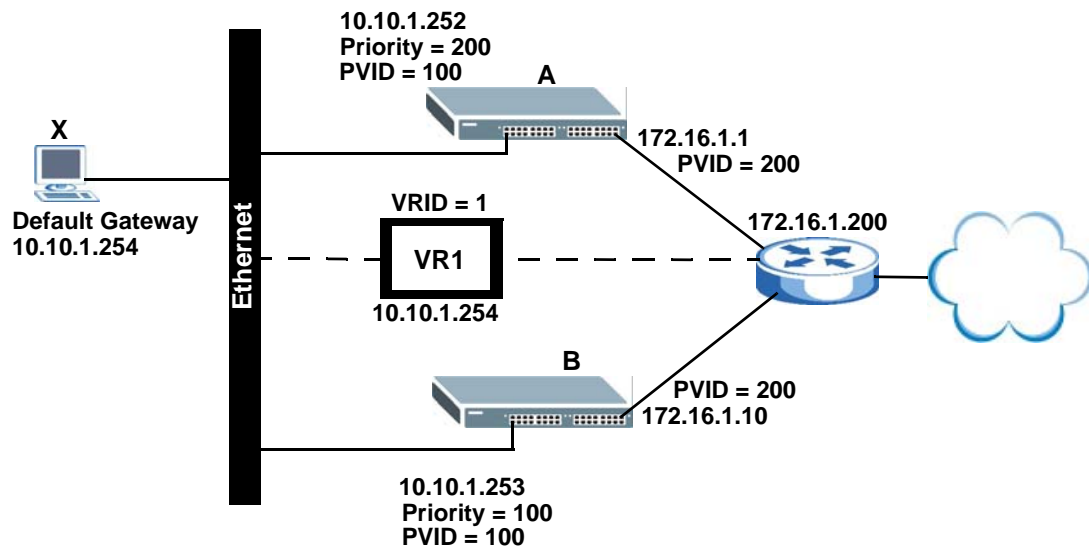
| COMMAND | DESCRIPTION | M | P |
|---|---|---|----|
| <code>router vrrp network <ip-address>/<mask-bits> vr-id <1~7> uplink-gateway <ip-address></code> | Adds a new VRRP network and enters the VRRP configuration mode. | C | 13 |
| <code>name <name></code> | Sets a descriptive name of the VRRP setting for identification purposes. | C | 13 |
| <code>priority <1~254></code> | Sets the priority of the uplink-gateway. | C | 13 |
| <code>interval <1~255></code> | Sets the time interval (in seconds) between Hello message transmissions. | C | 13 |
| <code>primary-virtual-ip <ip-address></code> | Sets the primary VRRP virtual gateway IP address. | C | 13 |
| <code>no primary-virtual-ip <ip-address></code> | Resets the primary VRRP virtual gateway IP address. | C | 13 |
| <code>secondary-virtual-ip <ip-address></code> | Sets the secondary VRRP virtual gateway IP address. | C | 13 |
| <code>no secondary-virtual-ip</code> | Sets the network to use the default secondary virtual gateway (0.0.0.0). | C | 13 |
| <code>no primary-virtual-ip</code> | Resets the network to use the default primary virtual gateway (interface IP address). | C | 13 |
| <code>inactive</code> | Disables the VRRP settings. | C | 13 |
| <code>no inactive</code> | Activates this VRRP. | C | 13 |

Table 211 VRRP Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|---|--|---|----|
| <code>no preempt</code> | Disables VRRP preemption mode. | C | 13 |
| <code>preempt</code> | Enables preemption mode. | C | 13 |
| <code>exit</code> | Exits from the VRRP command mode. | C | 13 |
| <code>no router vrrp network <ip-address>/<mask-bits> vr-id <1~7></code> | Deletes VRRP settings. | C | 13 |
| <code>interface route-domain <ip-address>/<mask-bits> ip vrrp authentication-key <key></code> | Sets the VRRP authentication key. <i>key</i> : Up to 8 alphanumeric characters. | C | 13 |
| <code>interface route-domain <ip-address>/<mask-bits> no ip vrrp authentication-key</code> | Resets the VRRP authentication key. | C | 13 |
| <code>show router vrrp</code> | Displays VRRP settings. | C | 13 |

95.3 Command Examples

The following figure shows a VRRP network example with the switches (**A** and **B**) implementing one virtual router **VR1** to ensure the link between the host **X** and the uplink gateway **G**. Host **X** is configured to use **VR1** (192.168.1.254) as the default gateway. Switch **A** has a higher priority, so it is the master router. Switch **B**, having a lower priority, is the backup router.

Figure 11 Example: VRRP

This example shows how to create the IP routing domains and configure the Switch to act as router **A** in the topology shown in [Figure 11 on page 331](#).

```
sysname# config
sysname(config)# vlan 100
sysname(config-vlan)# fixed 1-4
sysname(config-vlan)# untagged 1-4
sysname(config-vlan)# ip address 10.10.1.252 255.255.255.0
sysname(config-vlan)# exit
sysname(config) interface port-channel 1-4
sysname(config-interface)# pvid 100
sysname(config-interface)# exit
sysname(config)# vlan 200
sysname(config-vlan)# fixed 24-28
sysname(config-vlan)# untagged 24-28
sysname(config-vlan)# ip address 172.16.1.1 255.255.255.0
sysname(config-vlan)# exit
sysname(config)# interface port-channel 24-28
sysname(config-interface)# pvid 200
sysname(config-interface)# exit
sysname(config)# router vrrp network 10.10.1.252/24 vr-id 1 uplink-gateway
172.16.1.200
sysname(config-vrrp)# name VRRP-networkA
sysname(config-vrrp)# priority 200
sysname(config-vrrp)# interval 2
sysname(config-vrrp)# primary-virtual-ip 10.10.1.254
sysname(config-vrrp)# exit
sysname(config)#
```

This example shows how to create the IP routing domains and configure the Switch to act as router **B** in the topology shown in [Figure 11 on page 331](#).

```
sysname# config
sysname(config)# vlan 100
sysname(config-vlan)# fixed 1-4
sysname(config-vlan)# untagged 1-4
sysname(config-vlan)# ip address 10.10.1.253 255.255.255.0
sysname(config-vlan)# exit
sysname(config) interface port-channel 1-4
sysname(config-interface)# pvid 100
sysname(config-interface)# exit
sysname(config)# vlan 200
sysname(config-vlan)# fixed 24-28
sysname(config-vlan)# untagged 24-28
sysname(config-vlan)# ip address 172.16.1.10 255.255.255.0
sysname(config-vlan)# exit
sysname(config)# interface port-channel 24-28
sysname(config-interface)# pvid 200
sysname(config-interface)# exit
sysname(config)# router vrrp network 10.10.1.253/24 vr-id 1 uplink-gateway
172.16.1.200
sysname(config-vrrp)# name VRRP-networkB
sysname(config-vrrp)# interval 2
sysname(config-vrrp)# primary-virtual-ip 10.10.1.254
sysname(config-vrrp)# exit
sysname(config)#
```

ZULD Commands

Use these commands to configure ZULD on the Switch.

96.1 ZULD Overview

A unidirectional link is a connection where the link is up on both ends, but only one end can receive packets. This may happen if OAM was initially enabled but then disabled, there are misconfigured transmitting or receiving lines or the hardware is malfunctioning. ZyXEL Unidirectional Link Detection (ZULD) is a layer-2 protocol that can detect and disable these physical one-way links before they cause loops or communication malfunction.

ZULD must be enabled on the Switch and the port(s) in order to detect unidirectional links by monitoring OAMPDUs.



Ports advertise their unidirectional link detection capability using OAMPDUs, so all connected devices must support OAM as well as ZULD.



OAM must be enabled on other connected devices too. If OAM is not enabled initially, ZULD will not work.

96.2 Command Summary

The following section lists the commands for this feature.

Table 212 zuld Command Summary

| COMMAND | DESCRIPTION | M | P |
|------------------------------------|---|---|----|
| zuld | Enables ZULD on the Switch. | C | 13 |
| no zuld | Disables ZULD on the Switch. | C | 13 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |

Table 212 zuld Command Summary (continued)

| COMMAND | DESCRIPTION | M | P |
|----------------------------------|--|---|----|
| zuld | Enables ZULD on the specified port(s). | C | 13 |
| no zuld | Disables ZULD on the specified port(s). | C | 13 |
| zuld mode <normal aggressive> | Configures the ZULD mode. normal: ZULD only sends a syslog and trap when it detects a unidirectional link. aggressive: ZULD shuts down the port (puts it into an ErrDisable state) as well as sends a syslog and trap when it detects a unidirectional link. | C | 13 |
| zuld probe-time <5-65535> | Sets the length of time that ZULD waits before declaring that a link is unidirectional. When the probe time expires, and one port (either on the Switch or the connected device) still has not received an OAMPDU, then ZULD declares that the link is unidirectional. | C | 13 |
| show zuld [<port-list>] | Displays ZULD details and link state for all ports or the specified port(s). | E | 3 |
| show zuld summary | Displays ZULD details of each port in a summary table. | E | 3 |

96.3 Command Example

This example enables Ethernet OAM on the Switch and ports 1-3 first, then enables ZULD on the Switch and ports 1-3. It also sets a ZULD mode and displays the configuration details.

```

sysname# configure
sysname(config)# ethernet oam
sysname(config)# interface port-channel 1-3
sysname(config-interface)# ethernet oam
sysname(config-interface)# exit
sysname(config)# zuld
sysname(config)# interface port-channel 1-3
sysname(config-interface)# zuld
sysname(config-interface)# zuld mode aggressive
sysname(config-interface)# exit
sysname(config)# exit
sysname# show zuld 1-3
  Port 1
    Active           : Yes
    Mode             : Aggressive
    Probe Time       : -
    Link State       : Linkdown
  Port 2
    Active           : Yes
    Mode             : Aggressive
    Probe Time       : -
    Link State       : Linkdown
  Port 3
    Active           : Yes
    Mode             : Aggressive
    Probe Time       : -
    Link State       : Linkdown
sysname#

```

Additional Commands

Use these commands to configure or perform additional features on the Switch.

97.1 Command Summary

The following section lists the commands for this feature.

Table 213 Command Summary: Changing Modes or Privileges

| COMMAND | DESCRIPTION | M | P |
|------------------------------------|--|---|----|
| enable | Changes the session's privilege level to 14 and puts the session in enable mode (if necessary). The user has to provide the enable password. See Section 2.1.3.1 on page 15 . | E | 0 |
| enable <0-14> | Raises the session's privilege level to the specified level and puts the session in enable mode if the specified level is 13 or 14. The user has to provide the password for the specified privilege level. See Section 2.1.3.2 on page 15 . | E | 0 |
| disable | Changes the session's priority level to 0 and changes the mode to user mode. See Section 2.1.3.3 on page 16 . | E | 13 |
| configure | Changes the mode to config mode. | E | 13 |
| interface port-channel <port-list> | Enters config-interface mode for the specified port(s). | C | 13 |
| mvr <1-4094> | Enters config-mvr mode for the specified MVR (multicast VLAN registration). Creates the MVR, if necessary. | C | 13 |
| vlan <1-4094> | Enters config-vlan mode for the specified VLAN. Creates the VLAN, if necessary. | C | 13 |
| exit | Returns to the previous mode. | C | 13 |
| logout | Logs out of the CLI. | E | 0 |

Table 214 Command Summary: Additional Enable Mode

| COMMAND | DESCRIPTION | M | P |
|----------------------|---|---|----|
| baudrate <1 2 3 4 5> | Changes the console port speed. 1: 38400 bps 2: 19200 bps 3: 9600 bps 4: 57600 bps 5: 115200 bps | E | 13 |
| boot config <index> | Restarts the Switch (cold reboot) with the specified configuration file. | E | 13 |

Table 214 Command Summary: Additional Enable Mode (continued)

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>boot image <1 2></code> | The Switch supports dual firmware images, ras-0 and ras-1. Run this command, where <index> is 1 (ras-0) or 2 (ras-1) to specify which image is updated when firmware is loaded using the web configurator and to specify which image is loaded when the Switch starts up. | E | 13 |
| <code>cable-diagnostics <port-list></code> | Performs a physical wire-pair test of the Ethernet connections on the specified port(s). | E | 13 |
| <code>ping <ip host-name> [vlan <vlan-id>] [size <0-1472>] [-t]</code> | Sends Ping packets to the specified Ethernet device. <i>vlan-id</i> : Specifies the VLAN ID to which the Ethernet device belongs. <i>size <0-1472></i> : Specifies the size of the Ping packet. <i>-t</i> : Sends Ping packets to the Ethernet device indefinitely. Press [CTRL]+C to terminate the Ping process. | E | 0 |
| <code>ping help</code> | Provides more information about the specified command. | E | 0 |
| <code>reload config [1 2]</code> | Restarts the system (warm reboot) with the specified configuration file. 1: config-1 2: config-2 | E | 13 |
| <code>reset slot <slot-list></code> | Restarts the card in the selected slot. The card restarts using the last-saved configuration. Any unsaved changes are lost. | E | 13 |
| <code>show allarm-status</code> | Displays alarm status. | E | 0 |
| <code>show cpu-utilization</code> | Displays the CPU utilization statistics on the Switch. | E | 0 |
| <code>show cpu-utilization process</code> | Displays the CPU and memory usage of each process. | E | 0 |
| <code>show except-smac</code> | Displays whether the Switch is to drop the packets with an all-zero source MAC address (00:00:00:00:00:00). | E | 13 |
| <code>show hardware-monitor <C F></code> | This command is not available in all models. Displays current hardware monitor information with the specified temperature unit (Celsius C or Fahrenheit F). | E | 0 |
| <code>show interfaces transceiver <port-list></code> | Displays real-time SFP (Small Form Factor Pluggable) transceiver information and operating parameters on specified SFP port(s). The parameters include, for example, module temperature, module voltage, transmitting and receiving power. | E | 3 |
| <code>show memory</code> | Displays the memory utilization statistics on the Switch. | E | 3 |
| <code>show power-source-status</code> | Displays the status of each power module in the system. | E | 0 |
| <code>show rootguard</code> | Displays STP mode and root guard information. | E | 3 |
| <code>show sfp <port-list></code> | Displays real-time SFP (Small Form Factor Pluggable) transceiver operating parameters on specified SFP port(s). The parameters include, for example, module temperature, module voltage, transmitting and receiving power. | E | 3 |
| <code>show slot</code> | Displays general status information about each slot. | E | 13 |
| <code>show slot config</code> | Displays what type of card is installed in each slot and its current operational status. | E | 13 |
| <code>show slot config <slot-list></code> | Displays detailed information about the specified slots. | E | 13 |
| <code>show system-information</code> | Displays general system information. | E | 0 |
| <code>show version [flash]</code> | Display the version of the currently running firmware on the Switch. Optionally, display the version of the currently installed firmware on the flash memory. | E | 0 |

Table 214 Command Summary: Additional Enable Mode (continued)

| COMMAND | DESCRIPTION | M | P |
|--|---|---|----|
| <code>telnet ipv4_address</code> | Connects to a specified host using Telnet. | E | 13 |
| <code>test interface port-channel <port-list></code> | Performs an internal loopback test on the specified ports. The test returns <code>Passed!</code> or <code>Failed!</code> . | E | 13 |
| <code>write memory [<index>]</code> | Saves current configuration in volatile memory to the configuration file the Switch is currently using or the specified configuration file. | E | 13 |

Table 215 Command Summary: Additional Configure Mode

| COMMAND | DESCRIPTION | M | P |
|--|--|---|----|
| <code>bcp-transparency</code> | Enables Bridge Control Protocol (BCP) transparency on the Switch. | C | 13 |
| <code>default-management <in-band out-of-band></code> | Sets which traffic flow (in-band or out-of-band) the Switch sends packets originating from itself (such as SNMP traps) or packets with unknown source. | C | 13 |
| <code>except-smac zero-smac-drop</code> | Sets the Switch to filter and drop the packets with an all-zero source MAC address (00:00:00:00:00:00). | C | 13 |
| <code>hostname <name></code> | Sets the Switch's name for identification purposes. <i>name</i> : 1-64 printable characters; spaces are allowed if you put the string in double quotation marks (""). | C | 13 |
| <code>install help</code> | Displays command help information. | C | 13 |
| <code>install slot <slot-list> type <card-type></code> | Changes what type of card is in the slot without restarting the system. | C | 13 |
| <code>locator-led</code> | Turns on the LOCATOR LED on the Switch. By default, the LED blinks and automatically turns off after 30 minutes. This helps to locate the Switch that you are managing when multiple switches are installed in a rack or placed in the same room. | C | 13 |
| <code>locator-led <1-1440></code> | Changes how long (in minutes) the LOCATOR LED blinks for. | C | 13 |
| <code>mode zynos</code> | Changes the CLI mode to the Zynos format. | C | 13 |
| <code>no except-smac zero-smac-drop</code> | Sets the Switch to allow and forward the packets with an all-zero source MAC address (00:00:00:00:00:00). | C | 13 |
| <code>no install slot <slot></code> | Uninstalls the card in the slot. | C | 13 |
| <code>no locator-led</code> | Stops the LOCATOR LED from blinking immediately. | C | 13 |
| <code>no shutdown slot <slot-list></code> | Turns on the power to the slot. | C | 13 |
| <code>shutdown slot <slot-list></code> | Turns off the power to the slot. | C | 13 |
| <code>transceiver-ddm timer <1 - 4294967></code> | Sets the duration of the digital diagnostic monitoring (DDM) timer. This defines how often (in milliseconds) the Switch sends the digital diagnostic monitoring (DDM) information via the installed transceiver(s). | C | 13 |

97.2 Command Examples

This example checks the cable pairs on ports 1 and 4.

```

sysname# cable-diagnostics 1
Port   Channel   Pair status   Cable length (m)   Distance to fault (m)
-----
      1     pairA         Open              N/A                0.00
          pairB         Open              N/A                0.00
          pairC         Open              N/A                0.00
          pairD         Open              N/A                0.00
sysname# cable-diagnostics 4
Port   Channel   Pair status   Cable length (m)   Distance to fault (m)
-----
      4     pairA         Ok               5.55              N/A
          pairB         Ok               5.55              N/A
          pairC         Ok               5.55              N/A
          pairD         Ok               5.55              N/A

```

The following table describes the labels in this screen.

Table 216 Cable-diagnostics

| LABEL | DESCRIPTION |
|-------------------|---|
| Port | This is the number of the physical Ethernet port on the Switch. |
| Channel | An Ethernet cable usually has four pairs of wires. A 10BASE-T or 100BASE-TX port only use and test two pairs, while a 1000BASE-T port requires all four pairs. This displays the descriptive name of the wire-pair in the cable. |
| Pair status | Ok: The physical connection between the wire-pair is okay. Open: There is no physical connection (an open circuit detected) between the wire-pair. Short: There is an short circuit detected between the wire-pair. Unknown: The Switch failed to run cable diagnostics on the cable connected this port. Unsupported: The port is a fiber port or it is not active. |
| Cable length | This displays the total length of the Ethernet cable that is connected to the port when the Pair status is Ok and the Switch chipset supports this feature. This shows N/A if the Pair status is Open or Short . Check the Distance to fault . This shows Unsupported if the Switch chipset does not support to show the cable length. |
| Distance to fault | This displays the distance between the port and the location where the cable is open or shorted. This shows N/A if the Pair status is Ok . This shows Unsupported if the Switch chipset does not support to show the distance. |

This example sends Ping requests to an Ethernet device with IP address 172.16.37.254.

```

sysname# ping 172.16.37.254
Resolving 172.16.37.254... 172.16.37.254
  sent  rcvd  rate    rtt     avg     mdev     max     min  reply from
    1     1   100      0      0      0      0      0  172.16.37.254
    2     2   100      0      0      0      0      0  172.16.37.254
    3     3   100     10      1      3     10      0  172.16.37.254

```

The following table describes the labels in this screen.

Table 217 ping

| LABEL | DESCRIPTION |
|------------|---|
| sent | This field displays the sequence number of the ICMP request the Switch sent. |
| rcvd | This field displays the sequence number of the ICMP response the Switch received. |
| rate | This field displays the percentage of ICMP responses for ICMP requests. |
| rtt | This field displays the round trip time of the ping. |
| avg | This field displays the average round trip time to ping the specified IP address. |
| mdev | This field displays the standard deviation in the round trip time to ping the specified IP address. |
| max | This field displays the maximum round trip time to ping the specified IP address. |
| min | This field displays the minimum round trip time to ping the specified IP address. |
| reply from | This field displays the IP address from which the Switch received the ICMP response. |

This example shows the current status of the various alarms in the Switch.

```

sysname# show alarm-status
          name  status  suppressAlarm  alarmLED
-----
          VOLTAGE Normal          No           Off
          TEMPERATURE Normal          No           Off
          FAN Normal          No           Off
          POE OVER LOAD Normal          No           Off
          POE SHORT CIRCUIT Normal          No           Off
          POE POWERBOX Normal          Yes           Off

```

The following table describes the labels in this screen.

Table 218 show alarm-status

| LABEL | DESCRIPTION |
|--------|--|
| name | This field displays the name or type of the alarm. |
| status | This field displays the status of the alarm. Normal: The alarm is off. Error: The alarm is on. |

Table 218 show alarm-status (continued)

| LABEL | DESCRIPTION |
|---------------|--|
| suppressAlarm | This field displays whether or not the alarm is inactive. |
| alarmLED | This field displays whether or not the LED for this alarm is on. |

This example shows the current and recent CPU utilization.

```

sysname# show cpu-utilization
CPU usage status:
  baseline 1715384 ticks
  sec  ticks  util sec  ticks  util sec  ticks  util sec  ticks  util
  -----
    0 657543 61.67  1 255118 85.13  2 394329 77.01  3 620008 63.85
    4 195580 88.60  5 791000 53.89  6 137625 91.98  7 508456 70.36
  -----
                                SNIP
  -----

```

The following table describes the labels in this screen.

Table 219 show cpu-utilization

| LABEL | DESCRIPTION |
|----------|---|
| baseline | This field displays the number of CPU clock cycles per second. |
| sec | This field displays the historical interval. Interval 0 is the time starting one second ago to the current instant. Interval 1 is the time starting two seconds ago to one second ago. Interval 2 is the time starting three seconds ago to two seconds ago. |
| ticks | This field displays the number of CPU clock cycles the CPU was not used during the interval. |
| util | This field displays the CPU utilization during the interval. $util = [(baseline - ticks) / baseline] * 100$ |

This example looks at the current sensor readings from various places in the hardware. The display for your Switch may be different.

```

sysname# show hardware-monitor C

Customer Part
PSU  Serial Number  Number & Revision  Manufacturing  Fan Air Flow
-----
PSU1  DIYD11M00CN      20110124  front-to-back
PSU2  DIYD11M00DV      20110125  front-to-back

Temperature Unit : (C)
Temperature(%c)  Current    Max    Min  Threshold  Status
-----
          CPU    45.0    45.0  33.0    80.0  Normal
          MAC    47.0    47.0  32.0    90.0  Normal
          PHY1   45.0    45.0  31.0    90.0  Normal
          PHY2   45.0    45.0  32.0    90.0  Normal

FAN Speed(RPM)  Current    Max    Min  Threshold  Status
-----
          FAN1   9360   15960  9360    500  Normal
          FAN2   9360   16320  9360    500  Normal
          FAN3   9360   15720  9360    500  Normal
          FAN4   9480   15240  9360    500  Normal

FAN TRAY        Air Flow  Status
-----
FAN TRAY 1  front-to-back  Present
FAN TRAY 2  front-to-back  Present

Voltage(V)  Current    Max    Min  Threshold  Status
-----
 12V_PSU1   11.737   11.918  11.737  +/-10%  Normal
 12V_PSU2   11.676   11.858  11.676  +/-10%  Normal
sysname#

```

The following table describes the labels in this screen.

Table 220 show hardware-monitor

| LABEL | DESCRIPTION |
|-------------------|---|
| Customer Part | This displays information on the fan and power module kits installed in the Switch. |
| PSU | The PSU (Power Supply Unit) is the power module number. |
| Serial Number | This is a unique number that identifies the inserted power module. |
| Number & Revision | This is the customer part number and revision. |
| Manufacturing | This is the date (yyyy-mm-dd) the module was assembled. |
| Fan Air Flow | This displays the power module fan air flow. All fan air flows within a Switch must be consistent, that is either front-to-back or back-to-front. |
| Temperature Unit | This field displays the unit of measure for temperatures in this screen. |
| Temperature | This field displays the location of the temperature sensors. |
| Current | This field displays the current temperature at this sensor. |

Table 220 show hardware-monitor (continued)

| LABEL | DESCRIPTION |
|----------------|--|
| Max | This field displays the maximum temperature measured at this sensor. |
| Min | This field displays the minimum temperature measured at this sensor. |
| Threshold | This field displays the upper temperature limit at this sensor. |
| Status | Normal: The current temperature is below the threshold. Error: The current temperature is above the threshold. |
| FAN Speed(RPM) | This field displays the fans in the Switch. Each fan has a sensor that is capable of detecting and reporting when the fan speed falls below the threshold. |
| Current | This field displays the current speed of the fan at this sensor. |
| Max | This field displays the maximum speed of the fan measured at this sensor. |
| Min | This field displays the minimum speed of the fan measured at this sensor. It displays "<41" for speeds too small to measure. (See the User's Guide to find out what speeds are too small to measure in your Switch.) |
| Threshold | This field displays the minimum speed at which the fan should work. |
| Status | Normal: This fan is running above the minimum speed. Error: This fan is running below the minimum speed. |
| FAN TRAY | This is the is the power module number |
| Air Flow | This displays the fan module fan air flow. All fan air flows within a Switch must be consistent, that is either front-to-back or back-to-front. |
| Status | This displays whether the fan module is inserted (<code>Present</code>) or not (<code>Absent</code>). |
| Voltage(V) | This field displays the various power supplies in the Switch. Each power supply has a sensor that is capable of detecting and reporting when the voltage is outside tolerance. |
| Current | This field displays the current voltage at this power supply. |
| Max | This field displays the maximum voltage measured at this power supply. |
| Min | This field displays the minimum voltage measured at this power supply. |
| Threshold | This field displays the percentage tolerance within which the Switch still works. |
| Status | Normal: The current voltage is within tolerance. Error: The current voltage is outside tolerance. |

This example displays multicast VLAN configuration on the Switch.

```

sysname> show multicast vlan
Multicast Vlan Status

Index   VID   Type
-----  ---  -
      1  123  MVR

```

The following table describes the labels in this screen.

Table 221 show multicast vlan

| LABEL | DESCRIPTION |
|-------|---|
| Index | This field displays an entry number for the multicast VLAN. |
| VID | This field displays the multicast VLAN ID. |
| Type | This field displays what type of multicast VLAN this is. MVR: This VLAN is a Multicast VLAN Registration (MVR). Static: This VLAN is configured via IGMP snooping VLAN in fixed mode. Dynamic: This VLAN is learned dynamically in auto mode. See Chapter 31 on page 115 for more information about IGMP snooping VLAN and IGMP modes. |

This example shows the current status of Power over Ethernet.

```
sysname# show poe-status
Total Power (W)           : 185.0
Consuming Power (W)      : 0.0
Allocated Power (W)      : 0.0
Remaining Power (W)     : 185.0
```

The following table describes the labels in this screen.

Table 222 show poe-status

| LABEL | DESCRIPTION |
|-----------------|---|
| Total Power | This field displays the total power the Switch can provide to PoE-enabled devices. |
| Consuming Power | This field displays the amount of power the Switch is currently supplying to the PoE-enabled devices. |
| Allocated Power | This field displays the total amount of power the Switch has reserved for PoE after negotiating with the PoE device(s). Note: If the management mode is set to Consumption , this field shows NA . |
| Remaining Power | This field displays the amount of power the Switch can still provide for PoE. Note: The Switch must have at least 16 W of remaining power in order to supply power to a PoE device, even if the PoE device requested less than 16 W. |

This example looks at general system information about the Switch

The following table describes the labels in this screen.

Table 223 show system-information

| LABEL | DESCRIPTION |
|----------------|--|
| Product Model | This field displays the model name. |
| System Name | This field displays the system name (or hostname) of the Switch. |
| System Mode | This field displays standalone or stacking mode |
| System Contact | This field displays the name of the person in charge of this Switch. Use the snmp-server command to configure this. See Chapter 73 on page 270 . |

Table 223 show system-information (continued)

| LABEL | DESCRIPTION |
|--------------------|---|
| System Location | This field displays the geographic location of this Switch. Use the snmp-server command to configure this. See Chapter 73 on page 270 . |
| System up Time | This field displays how long the switch has been running since it last started up. |
| Ethernet Address | This field displays the MAC address of the Switch. |
| Bootbase Version | This field displays the bootbase version the Switch is running. |
| ZyNOS F/W Version | This field displays the firmware version the Switch is running. |
| Config Boot Image | This field displays whether the Switch is configured to run firmware 1 or 2 when it next starts. |
| Current Boot Image | This field displays whether the Switch is running firmware 1 or 2. |
| RomRasSize | This field displays how much ROM is used. |

This example displays run-time SFP (Small Form Factor Pluggable) parameters on ports 9 (the first SFP port 0, with an SFP transceiver installed) and 10 (the second SFP port 1, no SFP transceiver installed) on the Switch. You can also see the alarm and warning thresholds for temperature, voltage, transmission bias, transmission and receiving power as shown.

```

sysname# show sfp 9-10

SFP                : 0
Part Number        : SFP-SX-DDM
Series Number      : S081113001132
Revision           : V1.0
Transceiver        : 1000BASE-SX
Temperature(C) Alarm(80.00 ~ 0.00), Warning(75.00 ~ 5.00), Current(38.00)
Voltage(V) Alarm(3.50 ~ 3.10), Warning(3.45 ~ 3.15), Current(3.37)
Tx Bias(mA) Alarm(100.05 ~ 1.00), Warning(90.04 ~ 2.00), Current(5.25)
Tx Power(dBm) Alarm(-2.99 ~ -8.98), Warning(-3.49 ~ -8.48), Current(-6.05)
Rx Power(dBm) Alarm(-2.99 ~ -18.01), Warning(-3.49 ~ -17.39), Current(-4.24)

SFP                : 1
Not Available

```

This example displays run-time SFP (Small Form Factor Pluggable) parameters on port 21 on the Switch. You can also see the alarm and warning thresholds for temperature, voltage, transmission bias, transmission and receiving power as shown.

```

sysname# show interface transceiver 21
  Transceiver Information

Port                : 21 (SFP)
Vendor              : ZyXEL
Part Number         : SFP-LX-10-D
Series Number       : S081133000074
Revision            : V1.0
Date Code           : 2008-08-11
Transceiver         : 1000BASE-LX

++ : high alarm, + : high warn, - : low warn, -- : low alarm.

                Current  High ALarm  High Warn  Low Warn  Low Alarm
                Threshold Threshold  Threshold Threshold
-----
Temperature(C) ++  38.00      -1.00      75.00      5.00      0.00
Voltage(V)         3.36       3.50       3.45       3.15       3.10
Tx Bias(mA)        14.53      100.05     90.04       7.00       6.00
Tx Power(dBm)      -5.80       -2.99     -3.49      -8.96      -9.50
Rx Power(dBm)      +  -3.36       -2.99     -3.49     -20.50     -21.02
sysname#

```

This example displays the firmware version the Switch is currently using..

```

sysname# show version
  Current ZyNOS version: V3.80(BBA.3)b1 | 04/17/2008

```

This example runs an internal loopback test on ports 3-6.

```

sysname# test interface port-channel 3-6
Testing internal loopback on port 3 :Passed!
  Ethernet Port 3 Test ok.
Testing internal loopback on port 4 :Passed!
  Ethernet Port 4 Test ok.
Testing internal loopback on port 5 :Passed!
  Ethernet Port 5 Test ok.
Testing internal loopback on port 6 :Passed!
  Ethernet Port 6 Test ok.

```

This example displays route information to an Ethernet device with IP address 192.168.1.100.

```

sysname> traceroute 192.168.1.100
traceroute to 192.168.1.100, 30 hops max, 40 byte packet
  1:192.168.1.100 (10 ms) (10 ms) (0 ms)
traceroute done:
sysname>

```

PART VI

Appendices and Index of Commands

Default Values (350)

Legal Information (351)

Index of Commands (354)

Default Values

Some commands, particularly `no` commands, reset settings to their default values. The following table identifies the default values for these settings.

Table 224 Default Values for Reset Commands

| COMMAND | DEFAULT VALUE |
|---|--|
| <code>no aaa authentication enable</code> | Method 1: enable Method 2: none Method 3: none |
| <code>no aaa authentication login</code> | Method 1: local Method 2: none Method 3: none |
| <code>no aaa accounting update</code> | 0 minutes |
| <code>no arp inspection filter-aging-time</code> | 300 seconds |
| <code>no arp inspection log-buffer entries</code> | 32 messages |
| <code>no arp inspection log-buffer logs</code> | 5 syslog messages 1 second |
| <code>no radius-server <index></code> | IP address: 0.0.0.0 Port number: 1812 Key: blank |
| <code>no radius-accounting <index></code> | IP address: 0.0.0.0 Port number: 1813 Key: blank |

Legal Information

Copyright

Copyright © 2015 by ZyXEL Communications Corporation.

The contents of this publication may not be reproduced in any part or as a whole, transcribed, stored in a retrieval system, translated into any language, or transmitted in any form or by any means, electronic, mechanical, magnetic, optical, chemical, photocopying, manual, or otherwise, without the prior written permission of ZyXEL Communications Corporation.

Published by ZyXEL Communications Corporation. All rights reserved.

Disclaimer

ZyXEL does not assume any liability arising out of the application or use of any products, or software described herein. Neither does it convey any license under its patent rights nor the patent rights of others. ZyXEL further reserves the right to make changes in any products described herein without notice. This publication is subject to change without notice.

Trademarks

ZyNOS (ZyXEL Network Operating System) is a registered trademark of ZyXEL Communications, Inc. Other trademarks mentioned in this publication are used for identification purposes only and may be properties of their respective owners.

Certifications

Federal Communications Commission (FCC) Interference Statement

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operations.

FCC Warning

This device has been tested and found to comply with the limits for a Class A digital switch, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CE Mark Warning:

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Taiwanese BSMI (Bureau of Standards, Metrology and Inspection) A Warning:

警告使用者
這是甲類的資訊產品，在居住的環境使用時，
可能造成射頻干擾，在這種情況下，
使用者會被要求採取某些適當的對策。

Notices

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

CLASS 1 LASER PRODUCT

APPAREIL A LASER DE CLASS 1

PRODUCT COMPLIES WITH 21 CFR 1040.10 AND 1040.11.

PRODUIT CONFORME SELON 21 CFR 1040.10 ET 1040.11.

Viewing Certifications

Go to <http://www.zyxel.com> to view this product's documentation and certifications.

ZyXEL Limited Warranty

ZyXEL warrants to the original end user (purchaser) that this product is free from any defects in material or workmanship for a specific period (the Warranty Period) from the date of purchase. The Warranty Period varies by region. Check with your vendor and/or the authorized ZyXEL local distributor for details about the Warranty Period of this product. During the warranty period, and upon proof of purchase, should the product have indications of failure due to faulty workmanship and/or materials, ZyXEL will, at its discretion, repair or replace the defective products or components without charge for either parts or labor, and to whatever extent it shall deem necessary to restore the product or components to proper

operating condition. Any replacement will consist of a new or re-manufactured functionally equivalent product of equal or higher value, and will be solely at the discretion of ZyXEL. This warranty shall not apply if the product has been modified, misused, tampered with, damaged by an act of God, or subjected to abnormal working conditions.

Note

Repair or replacement, as provided under this warranty, is the exclusive remedy of the purchaser. This warranty is in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular use or purpose. ZyXEL shall in no event be held liable for indirect or consequential damages of any kind to the purchaser.

To obtain the services of this warranty, contact your vendor. You may also refer to the warranty policy for the region in which you bought the device at http://www.zyxel.com/web/support_warranty_info.php.

Registration

Register your product online to receive e-mail notices of firmware upgrades and information at www.zyxel.com for global products, or at www.us.zyxel.com for North American products.

Index of Commands



Use of undocumented commands or misconfiguration can damage the unit and possibly render it unusable.

| | |
|--|-----|
| [circuit-id [slot-port] [vlan] [hostname] [string <string>]] [remote-id [mac] [string <string>]] | 71 |
| 8021p-priority <0-7> | 207 |
| aaa accounting commands <privilege> stop-only tacacs+ [broadcast] | 24 |
| aaa accounting dot1x <start-stop stop-only> <radius tacacs+> [broadcast] | 25 |
| aaa accounting exec <start-stop stop-only> <radius tacacs+> [broadcast] | 25 |
| aaa accounting system <radius tacacs+> [broadcast] | 25 |
| aaa accounting update periodic <1-2147483647> | 24 |
| aaa authentication enable <method1> [<method2> ...] | 24 |
| aaa authentication login <method1> [<method2> ...] | 24 |
| aaa authorization console | 25 |
| aaa authorization dot1x radius | 25 |
| aaa authorization exec <radius tacacs+> | 25 |
| admin-password [cipher] <pw-string> | 217 |
| admin-password <pw-string> <confirm-string> | 217 |
| alarm-index | 256 |
| anti arpscan | 27 |
| anti arpscan host threshold <2-100> | 27 |
| anti arpscan port threshold <2-255> | 28 |
| anti arpscan trust | 28 |
| anti arpscan trust host <ip-address> <mask> [name <name>] | 28 |
| area <area-id> | 212 |
| area <area-id> authentication | 212 |
| area <area-id> authentication message-digest | 212 |
| area <area-id> default-cost <0-16777214> | 212 |
| area <area-id> name <name> | 212 |
| area <area-id> stub | 212 |
| area <area-id> stub no-summary | 212 |
| area <area-id> virtual-link <router-id> authentication-key <key> | 212 |
| area <area-id> virtual-link <router-id> | 212 |
| area <area-id> virtual-link <router-ID> authentication-same-as-area | 213 |
| area <area-id> virtual-link <router-id> message-digest-key <keyid> md5 <key> | 213 |
| area <area-id> virtual-link <router-id> name <name> | 213 |
| arp aging-time <60-1000000> | 29 |
| arp inspection | 31 |
| arp inspection filter-aging-time <1-2147483647> | 31 |
| arp inspection filter-aging-time none | 31 |
| arp inspection log-buffer entries <0-1024> | 32 |
| arp inspection log-buffer logs <0-1024> interval <0-86400> | 32 |
| arp inspection trust | 32 |
| arp inspection vlan <vlan-list> | 32 |
| arp inspection vlan <vlan-list> logging [all none permit deny] | 32 |
| arp name <name> ip <ip-address> mac <mac-addr> vlan <vlan-id> interface port-channel <port-list> | 29 |
| arp name <name> ip <ip-address> mac <mac-addr> vlan <vlan-id> interface port-channel | |

| | |
|---|-----|
| <port-list> inactive | 29 |
| arp-learning <arp-reply gratuitous-arp arp-request> | 36 |
| bandwidth-control | 38 |
| bandwidth-limit cir | 38 |
| bandwidth-limit cir <rate> | 38 |
| bandwidth-limit egress | 38 |
| bandwidth-limit egress <rate> | 38 |
| bandwidth-limit ingress | 38 |
| bandwidth-limit ingress <rate> | 38 |
| bandwidth-limit pir | 38 |
| bandwidth-limit pir <rate> | 38 |
| baudrate <1 2 3 4 5> | 336 |
| bcp-transparency | 338 |
| bmstorm-limit | 41 |
| bmstorm-limit <rate> | 42 |
| boot config <index> | 336 |
| boot image <1 2> | 337 |
| bpdu-control <peer tunnel discard network> | 124 |
| bpduguard | 40 |
| bpduguard | 40 |
| broadcast-limit | 42 |
| broadcast-limit <pkt/s> | 42 |
| cable-diagnostics <port-list> | 337 |
| cc-interval <100ms 1s 10s 1min 10min> | 48 |
| classifier <name> < [weight <0-65535>] [packet-format <802.3untag 802.3tag EtherIIuntag EtherIItag>] [priority <0-7>] [inner-priority <0-7>] [vlan <vlan-id>] [inner-vlan <vlan-id-list>] [ethernet-type <ether-num ip ipx arp rarp appletalk decnet IPv6>] [source-mac <src-mac-addr> [mask <mask>]] [source-port <port-list>] [source-trunk <trunk-list>] [destination-port <port-list>] [destination-mac <dest-mac-addr> [mask <mask>]] [ip-packet-length <0-65535> to <0-65525>] [dscp <0-63>] [precedence <0-7>] [tos <0-255>] [ipv6-dscp <0-63>] [ip-protocol <protocol-num tcp udp icmp egg os-pf rsvp igmp igp pim ipsec> [establish-only]] [ipv6-next-header <protocol-num tcp udp icmpv6> [establish-only]] [source-ip <src-ip-addr> [mask-bits <mask-bits>]] [ipv6-source-ip <src-ipv6-addr> [prefix-length <prefix-length>]] [source-socket <socket-num> [to <socket-num>]] [destination-ip <dest-ip-addr> [mask-bits <mask-bits>]] [ipv6-destination-ip <dest-ipv6-addr> [prefix-length <prefix-length>]] [destination-socket <socket-num> [to <socket-num>]] [time-range <name>] [log] [count] [inactive]> | 54 |
| classifier logging | 55 |
| classifier logging interval <0-65535> | 55 |
| classifier match-order <auto/manual> | 55 |
| clear anti arpscan host | 28 |
| clear anti arpscan host interface port-channel <port-list> | 28 |
| clear arp inspection filter | 31 |
| clear arp inspection log | 32 |
| clear arp inspection statistics | 31 |
| clear arp inspection statistics vlan <vlan-list> | 31 |
| clear classifier match-count [<name>] | 53 |
| clear cpu-protection interface port-channel <port-list> cause <ARP BPDU IGMP> | 85 |
| clear dhcp snooping database statistics | 77 |
| clear ethernet cfm linktrace | 47 |
| clear ethernet cfm mep-ccmdb | 47 |
| clear ethernet cfm mep-defects | 47 |
| clear ethernet cfm mip-ccmdb | 47 |
| clear igmp-snooping statistics all | 115 |
| clear igmp-snooping statistics port | 115 |
| clear igmp-snooping statistics system | 115 |
| clear igmp-snooping statistics vlan | 115 |

| | |
|---|-----|
| clear interface <port-num> | 124 |
| clear ip arp | 29 |
| clear ip arp interface port-channel <port-list> | 29 |
| clear ip arp ip <ip-address> | 29 |
| clear ipv6 mld snooping-proxy statistics all | 147 |
| clear ipv6 mld snooping-proxy statistics port | 147 |
| clear ipv6 mld snooping-proxy statistics system | 147 |
| clear ipv6 mld snooping-proxy statistics vlan | 147 |
| clear ipv6 neighbor | 152 |
| clear ipv6 neighbor <interface-type> <interface-number> | 152 |
| clear ipv6 source binding [address <ipv6-address> prefix <ipv6-address/prefix-length>] | 153 |
| clear l2protocol-tunnel | 162 |
| clear lldp remote_info | 169 |
| clear lldp remote_info interface port-channel <port-list> | 169 |
| clear lldp statistic | 169 |
| clear logging | 179 |
| clear loopguard | 181 |
| clear pppoe intermediate-agent statistics | 233 |
| clear pppoe intermediate-agent statistics vlan <vlan-list> | 233 |
| clear priority-flow-control statistics interface port-channel <port-list> | 65 |
| cluster <vlan-id> | 57 |
| cluster member <mac> password <password> | 57 |
| cluster name <cluster name> | 57 |
| cluster rcommand <mac> | 57 |
| configure | 336 |
| connected-port <port-list> | 196 |
| copy running-config help | 263 |
| copy running-config interface port-channel <port> <port-list> [<attribute> [<...>]] | 263 |
| copy running-config slot <slot> <slot-list> | 263 |
| copy running-config slot <slot> <slot-list> [bandwidth-limit ...] | 263 |
| copy running-config tftp <ip> <remote-file> | 302 |
| copy tftp config <index> <ip> <remote-file> | 302 |
| copy tftp config merge <index> <ip> <remote-file> | 302 |
| copy tftp flash <ip> <remote-file> | 302 |
| cpu-protection cause <ARP BPDU IGMP> rate-limit <0-256> | 85 |
| cx4-length <0.5 1 3 5 10 15> | 124 |
| default-management <in-band out-of-band> | 338 |
| destination monitor-port <port-num> <untagged tagged> | 196 |
| dhcp dhcp-vlan <vlan-id> | 78 |
| dhcp option profile <name> | 71 |
| dhcp relay <vlan-id> helper-address <remote-dhcp-server1> [<remote-dhcp-server2>] [<remote-dhcp-server3>] [option profile <name>] | 72 |
| dhcp relay <vlan-id> helper-address <remote-dhcp-server1> [<remote-dhcp-server2>] [<remote-dhcp-server3>] [option] [information] | 71 |
| dhcp relay <vlan-id> interface port-channel <port-list> option profile <name> | 72 |
| dhcp relay-broadcast | 72 |
| dhcp server <vlan-id> starting-address <ip-addr> <subnet-mask> size-of-client-ip-pool <1-253> | 73 |
| dhcp server <vlan-id> starting-address <ip-addr> <subnet-mask> size-of-client-ip-pool <1-253> [default-gateway <ip-addr>] [primary-dns <ip-addr>] [secondary-dns <ip-addr>] | 73 |
| dhcp smart-relay | 72 |
| dhcp smart-relay helper-address <remote-dhcp-server1> [<remote-dhcp-server2>] [<remote-dhcp-server3>] | 72 |
| dhcp smart-relay information | 72 |
| dhcp smart-relay interface port-channel <port-list> option profile <name> | 73 |
| dhcp smart-relay option | 73 |

| | |
|---|-----|
| dhcp smart-relay option profile <name> | 73 |
| dhcp snooping | 76 |
| dhcp snooping database <tftp://host/filename> | 76 |
| dhcp snooping database timeout <seconds> | 76 |
| dhcp snooping database write-delay <seconds> | 76 |
| dhcp snooping limit rate <pps> | 77 |
| dhcp snooping trust | 77 |
| dhcp snooping vlan <vlan-list> | 77 |
| dhcp snooping vlan <vlan-list> information | 77 |
| dhcp snooping vlan <vlan-list> interface port-channel <port-list> option profile <name> 77 | |
| dhcp snooping vlan <vlan-list> option | 77 |
| dhcp snooping vlan <vlan-list> option profile <name> | 77 |
| diffserv | 80 |
| diffserv | 80 |
| diffserv dscp <0-63> priority <0-7> | 80 |
| disable | 336 |
| display aaa <[authentication][authorization][server]> | 81 |
| display user <[system][snmp]> | 81 |
| distance <10-255> | 213 |
| distance <10-255> | 255 |
| dlf-limit | 42 |
| dlf-limit <pkt/s> | 42 |
| egress set <port-list> | 231 |
| enable | 336 |
| enable <0-14> | 336 |
| eo-conferencing streaming-video video-signaling> | 168 |
| erase running-config | 263 |
| erase running-config help | 263 |
| erase running-config interface port-channel <port-list> [<attribute> [<...>]] ... | 263 |
| errdisable detect cause <ARP BPDU IGMP> | 85 |
| errdisable detect cause <ARP BPDU IGMP> mode <inactive-port inactive-reason rate-limit- tation> | 85 |
| errdisable recovery | 85 |
| errdisable recovery cause <loopguard ARP BPDU IGMP> | 85 |
| errdisable recovery cause <loopguard ARP BPDU IGMP> interval <30-2592000> | 85 |
| ethernet cfm | 47 |
| ethernet cfm linktrace mac <mac-address> mep <mep-id> ma <ma-index> md <md-index> [mip- ccmdb] [[ttl <ttl>] | 47 |
| ethernet cfm linktrace remote-mep <mep-id> mep <mep-id> ma <ma-index> md <md-index> [mip- ccmdb] [[ttl <ttl>] | 47 |
| ethernet cfm loopback mac <mac-address> mep <mep-id> ma <ma-index> md <md-index> [size <0-1500>][count <1-1024>] | 47 |
| ethernet cfm loopback remote-mep <mep-id> mep <mep-id> ma <ma-index> md <md-index> [size <0-1500>][count <1-1024>] | 47 |
| ethernet cfm ma <ma-index> format <vid string integer> name <ma-name> md <md-index> pri- mary-vlan <1-4094> | 48 |
| ethernet cfm management-address-domain ip [<ip-addr>] | 49 |
| ethernet cfm md <md-index> format <dns mac string> name <md-name> level <0-7> | 49 |
| ethernet cfm virtual-mac <mac-addr> | 49 |
| ethernet oam | 88 |
| ethernet oam | 89 |
| ethernet oam mode <active passive> | 89 |
| ethernet oam remote-loopback ignore-rx | 89 |
| ethernet oam remote-loopback start <port> | 88 |
| ethernet oam remote-loopback stop <port> | 88 |
| ethernet oam remote-loopback supported | 89 |
| ethernet oam remote-loopback test <port> [<number-of-packets> [<packet-size>]] ... | 89 |
| etherstats-index | 256 |

| | |
|---|-----|
| ets | 67 |
| ets traffic-class binding <tc-id0> <tc-id1> <tc-id2> <tc-id3> <tc-id4> <tc-id5> <tc-id6> <tc-id7> | 67 |
| event-index | 256 |
| except-smac zero-smac-drop | 338 |
| exit | 112 |
| exit | 129 |
| exit | 213 |
| exit | 255 |
| exit | 331 |
| exit | 336 |
| exit | 48 |
| exit | 82 |
| external-alarm <index> name <name_string> | 94 |
| fe-spq <q0 q1 ... q7> | 248 |
| fixed <port-list> | 313 |
| flow-control | 124 |
| forbidden <port-list> | 313 |
| frame-type <all tagged untagged> | 124 |
| garp join <100-65535> leave <200-65535> leaveall <200-65535> | 96 |
| ge-spq <q0 q1 ... q7> | 247 |
| green-ethernet auto-power-down | 99 |
| green-ethernet auto-power-down | 99 |
| green-ethernet eee | 99 |
| green-ethernet eee | 99 |
| green-ethernet short-reach | 99 |
| green-ethernet short-reach | 99 |
| group <name> start-address <ip> end-address <ip> | 207 |
| gvrp | 102 |
| help | 12 |
| history | 12 |
| historycontrol-index | 256 |
| hostname <name> | 338 |
| https cert-regeneration <rsa dsa> | 105 |
| hybrid-spq <q0 q1 ... q7> | 247 |
| hybrid-spq lowest-queue <q0 q1 ... q7> | 247 |
| id-permission < none chassis management chassis-management> | 48 |
| igmp-filtering | 122 |
| igmp-filtering profile <name> | 122 |
| igmp-filtering profile <name> start-address <ip> end-address <ip> | 122 |
| igmp-flush | 115 |
| igmp-group-limited | 119 |
| igmp-group-limited number <number> | 119 |
| igmp-immediate-leave | 119 |
| igmp-querier-mode <auto fixed edge> | 120 |
| igmp-snooping | 115 |
| igmp-snooping 8021p-priority <0-7> | 115 |
| igmp-snooping authentication | 118 |
| igmp-snooping authentication-timeout <0-3000> | 115 |
| igmp-snooping fast-leave-timeout <200-6348800> | 118 |
| igmp-snooping filtering | 115 |
| igmp-snooping filtering profile <name> | 118 |
| igmp-snooping filtering profile <name> start-address <ip> end-address <ip> | 115 |
| igmp-snooping group-limited | 118 |
| igmp-snooping group-limited action <deny replace> | 119 |
| igmp-snooping group-limited number <number> | 119 |
| igmp-snooping host-timeout <1-16711450> | 116 |
| igmp-snooping leave-mode <normal immediate fast> | 119 |
| igmp-snooping leave-proxy | 116 |

| | |
|--|-----|
| igmp-snooping leave-timeout <1-16711450> | 116 |
| igmp-snooping leave-timeout <200-6348800> | 119 |
| igmp-snooping querier | 116 |
| igmp-snooping querier-mode <auto fixed edge> | 119 |
| igmp-snooping report-proxy | 116 |
| igmp-snooping reserved-multicast-frame <drop flooding> | 116 |
| igmp-snooping unknown-multicast-frame <drop flooding> | 116 |
| igmp-snooping vlan <vlan-id> [name <name>] | 118 |
| igmp-snooping vlan mode <auto fixed> | 117 |
| inactive | 124 |
| inactive | 196 |
| inactive | 207 |
| inactive | 313 |
| inactive | 330 |
| inactive | 5 |
| ingress-check | 314 |
| install help | 338 |
| install slot <slot-list> type <card-type> | 338 |
| interface port-channel <port-list> | 102 |
| interface port-channel <port-list> | 113 |
| interface port-channel <port-list> | 118 |
| interface port-channel <port-list> | 122 |
| interface port-channel <port-list> | 124 |
| interface port-channel <port-list> | 146 |
| interface port-channel <port-list> | 147 |
| interface port-channel <port-list> | 162 |
| interface port-channel <port-list> | 166 |
| interface port-channel <port-list> | 181 |
| interface port-channel <port-list> | 186 |
| interface port-channel <port-list> | 192 |
| interface port-channel <port-list> | 195 |
| interface port-channel <port-list> | 231 |
| interface port-channel <port-list> | 233 |
| interface port-channel <port-list> | 241 |
| interface port-channel <port-list> | 243 |
| interface port-channel <port-list> | 246 |
| interface port-channel <port-list> | 264 |
| interface port-channel <port-list> | 271 |
| interface port-channel <port-list> | 28 |
| interface port-channel <port-list> | 309 |
| interface port-channel <port-list> | 314 |
| interface port-channel <port-list> | 32 |
| interface port-channel <port-list> | 320 |
| interface port-channel <port-list> | 322 |
| interface port-channel <port-list> | 323 |
| interface port-channel <port-list> | 326 |
| interface port-channel <port-list> | 334 |
| interface port-channel <port-list> | 336 |
| interface port-channel <port-list> | 36 |
| interface port-channel <port-list> | 38 |
| interface port-channel <port-list> | 40 |
| interface port-channel <port-list> | 41 |
| interface port-channel <port-list> | 49 |
| interface port-channel <port-list> | 64 |
| interface port-channel <port-list> | 67 |
| interface port-channel <port-list> | 70 |
| interface port-channel <port-list> | 77 |
| interface port-channel <port-list> | 80 |
| interface port-channel <port-list> | 85 |

| | |
|--|-----|
| interface port-channel <port-list> | 89 |
| interface port-channel <port-list> | 99 |
| interface route-domain <ip-address>/<mask-bits> | 112 |
| interface route-domain <ip-address>/<mask-bits> | 129 |
| interface route-domain <ip-address>/<mask-bits> | 211 |
| interface route-domain <ip-address>/<mask-bits> | 255 |
| interface route-domain <ip-address>/<mask-bits> | 82 |
| interface route-domain <ip-address>/<mask-bits> ip vrrp authentication-key <key> | 331 |
| interface route-domain <ip-address>/<mask-bits> no ip vrrp authentication-key ... | 331 |
| interface vlan <1-4094> | 144 |
| interface vlan <1-4094> | 151 |
| interface vlan <1-4094> | 153 |
| interface-id | 256 |
| interval <1~255> | 330 |
| intrusion-lock | 124 |
| ip address <ip> <mask> | 130 |
| ip address <ip-address> <mask> | 318 |
| ip address <ip-address> <mask> manageable | 318 |
| ip address default-gateway <ip> | 130 |
| ip address default-gateway <ip-address> | 319 |
| ip address default-management <ip-address> <mask> | 318 |
| ip address default-management dhcp-bootp | 318 |
| ip address default-management dhcp-bootp release | 318 |
| ip address default-management dhcp-bootp renew | 318 |
| ip dvmrp | 83 |
| ip igmp <v1 v2 v3> | 112 |
| ip igmp last-member-query-interval <1-25> | 113 |
| ip igmp query-interval <1-65535> | 113 |
| ip igmp query-max-response-time <1-25> | 113 |
| ip igmp robustness-variable <2-255> | 113 |
| ip load-sharing | 177 |
| ip load-sharing <sip sip-dip> | 177 |
| ip load-sharing aging-time <0-86400> | 177 |
| ip load-sharing discover-time <0-86400> | 177 |
| ip load-sharing maximum-path | 178 |
| ip name-server <ip ipv6> | 130 |
| ip ospf authentication-key <key> | 211 |
| ip ospf authentication-same-aa | 211 |
| ip ospf authentication-same-as-area | 212 |
| ip ospf cost <1-65535> | 212 |
| ip ospf message-digest-key <key> | 212 |
| ip ospf priority <0-255> | 212 |
| ip policy-route <name> | 227 |
| ip policy-route <name> inactive | 227 |
| ip policy-route <name> sequence <number> <permit deny> classifier <classifier> next-hop <ip-addr> | 227 |
| ip rip direction <Outgoing Incoming Both None> version <v1 v2b v2m> | 255 |
| ip route <ip> <mask> <next-hop-ip> [metric <metric>] [name <name>] [inactive] ... | 289 |
| ip source binding <mac-addr> vlan <vlan-id> <ip> [interface port-channel <interface-id>] 135 | |
| ip source binding arp-freeze | 135 |
| ip source binding arp-freeze interface port-channel <port-list> | 135 |
| ip source binding arp-freeze vlan <vlan-list> | 135 |
| ipmc egress-untag-vlan <vlan-id> | 113 |
| ipv6 | 144 |
| ipv6 address <ipv6-address>/<prefix> | 144 |
| ipv6 address <ipv6-address>/<prefix> eui-64 | 144 |
| ipv6 address <ipv6-address>/<prefix> link-local | 145 |
| ipv6 address autoconfig | 145 |

| | |
|---|-----|
| ipv6 address default-gateway <gateway-ipv6-address> | 145 |
| ipv6 address dhcp client <ia-na> | 145 |
| ipv6 address dhcp client <ia-na> [rapid-commit] | 145 |
| ipv6 address dhcp client information refresh minimum <600-4294967295> | 145 |
| ipv6 address dhcp client option <[dns] [domain-list]> | 145 |
| ipv6 dhcp relay vlan <1-4094> helper-address <remote-dhcp-server> | 146 |
| ipv6 dhcp relay vlan <1-4094> option interface-id | 146 |
| ipv6 dhcp relay vlan <1-4094> option remote-id <remote-id> | 146 |
| ipv6 dhcp trust | 146 |
| ipv6 dhcp trust | 146 |
| ipv6 hop-limit <1-255> | 152 |
| ipv6 icmp error-interval <0-2147483647> [bucket-size <1-200>] | 147 |
| ipv6 mld snooping-proxy | 148 |
| ipv6 mld snooping-proxy 8021p-priority <0-7> | 148 |
| ipv6 mld snooping-proxy filtering | 148 |
| ipv6 mld snooping-proxy filtering group-limited | 147 |
| ipv6 mld snooping-proxy filtering group-limited number <number> | 148 |
| ipv6 mld snooping-proxy filtering profile <name> | 148 |
| ipv6 mld snooping-proxy filtering profile <name> start-address <ip> end-address <ip> 148 | |
| ipv6 mld snooping-proxy vlan <vlan-id> | 148 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> 148 | |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> fast-leave-timeout <2-16775168> | 148 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> leave-timeout <2-16775168> | 148 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> mode <immediate normal fast> | 148 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream query-interval <1000-31744000> | 148 |
| ipv6 mld snooping-proxy vlan <vlan-id> downstream query-max-response-time <1000-25000> 148 | |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream interface port-channel <port-list> | 149 |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream last-listener-query-interval <1-8387584> 149 | |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream query-interval <1000-31744000> .. | 149 |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream query-max-response-time <1000-25000> 149 | |
| ipv6 mld snooping-proxy vlan <vlan-id> upstream robustness-variable <1-25> | 149 |
| ipv6 nd dad-attempts <0-600> | 151 |
| ipv6 nd managed-config-flag | 151 |
| ipv6 nd ns-interval <1000-3600000> | 151 |
| ipv6 nd other-config-flag | 151 |
| ipv6 nd prefix <ipv6-prefix>/<prefix-length> | 151 |
| ipv6 nd prefix <ipv6-prefix>/<prefix-length> <[valid-lifetime <0-4294967295>] [pre- ferred-lifetime <0-4294967295>] [no-autoconfig] [no-onlink] [no-advertise]> .. | 151 |
| ipv6 nd ra interval minimum <3-1350> maximum <4-1800> | 151 |
| ipv6 nd ra lifetime <0-9000> | 151 |
| ipv6 nd ra suppress | 151 |
| ipv6 nd reachable-time <1000-2147483647> | 151 |
| ipv6 neighbor <interface-type> <interface-number> <ipv6-address> <mac-address> .. | 153 |
| ipv6 route <ipv6-prefix>/<prefix-length> <next-hop> | 152 |
| ipv6 route <ipv6-prefix>/<prefix-length> <next-hop> <interface-type> <interface-number> 152 | |
| ipv6 snooping attach-policy <name> | 153 |
| ipv6 snooping policy <name> | 153 |
| ipv6 source binding <ipv6-address ipv6-address/prefix-length> [mac <mac-addr>] [vlan <vlan-id>] [interface port-channel <port-list>] | 153 |
| ipv6 source-guard policy <name> | 154 |

| | |
|---|-----|
| kick tcp <session id> | 131 |
| l2protocol-tunnel | 162 |
| l2protocol-tunnel | 163 |
| l2protocol-tunnel cdp | 162 |
| l2protocol-tunnel mac <mac-addr> | 163 |
| l2protocol-tunnel mode <access tunnel> | 162 |
| l2protocol-tunnel point-to-point | 162 |
| l2protocol-tunnel point-to-point lacp | 162 |
| l2protocol-tunnel point-to-point pagp | 162 |
| l2protocol-tunnel point-to-point udld | 163 |
| l2protocol-tunnel stp | 163 |
| l2protocol-tunnel vtp | 163 |
| lacp | 307 |
| lacp system-priority <1-65535> | 307 |
| limit address-count <number> | 153 |
| lldp | 168 |
| lldp admin-status <disabled tx-only rx-only tx-rx> | 166 |
| lldp basic-tlv management-address | 166 |
| lldp basic-tlv port-description | 166 |
| lldp basic-tlv system-capabilities | 166 |
| lldp basic-tlv system-description | 166 |
| lldp basic-tlv system-name | 166 |
| lldp dcbx application <ether-type><fcoe> priority <0-7> | 68 |
| lldp med location civic [county <county>] [city <city>] [division <division>] [neighbor <neighbor>] [street <street>] [leading-street-direction <value>] [trailing-street-suffix <value>] [street-suffix <value>] [house-number <num>] [house-number-suffix <value>] [landmark <landmark>] [ad- ditional-location <value>] [name <value>] [zip-code <value>] [building <value>] [unit <value>] [floor <value>] [room-number <value>] [place-type <value>] [postal-community-name <value>] [post-office- box <value>] [additional-code <value>] | 166 |
| lldp med location coordinate [latitude <north south> <value>] [longitude <west east > <value>] [altitude <meters floor> <value>] [datum <WGS84 NAD83-NAVD88 NAD83- MLLW>] | 167 |
| lldp med location elin <number> | 167 |
| lldp med network-policy <voice voice-signaling guest-voice guest-voice-signal- ing softphone-voice video-conferencing streaming-video video-signaling> [tagged untagged] [vlan <vlan-id>] [priority <priority>] [dscp <dscp>] | 167 |
| lldp med topology-change-notification | 167 |
| lldp notification | 167 |
| lldp org-specific-tlv dot1 dcbx-application-priority | 70 |
| lldp org-specific-tlv dot1 dcbx-ets-configuration | 70 |
| lldp org-specific-tlv dot1 dcbx-pfc-configuration | 70 |
| lldp org-specific-tlv dot1 port-protocol-vlan-id | 167 |
| lldp org-specific-tlv dot1 port-vlan-id | 167 |
| lldp org-specific-tlv dot3 link-aggregation | 167 |
| lldp org-specific-tlv dot3 mac-phy | 167 |
| lldp org-specific-tlv dot3 max-frame-size | 167 |
| lldp org-specific-tlv dot3 power-via-mdi | 167 |
| lldp org-specific-tlv med location | 167 |
| lldp org-specific-tlv med network-policy | 167 |
| lldp reinitialize-delay <1-10> | 168 |
| lldp transmit-delay <1-8192> | 168 |
| lldp transmit-hold <2-10> | 169 |
| lldp transmit-interval <5-32768> | 169 |
| locator-led | 338 |
| locator-led <1-1440> | 338 |
| logins username <name> password [cipher] <password> privilege <0-14> | 180 |
| logout | 336 |

| | |
|---|-----|
| loopguard | 181 |
| loopguard | 181 |
| mac-address | 46 |
| mac-aging-time <10-1000000> | 183 |
| mac-authentication | 185 |
| mac-authentication | 186 |
| mac-authentication nameprefix <name-string> | 185 |
| mac-authentication password <name-string> | 185 |
| mac-authentication timeout <1-3000> | 185 |
| mac-authentication trusted-vlan <vlan-list> | 186 |
| mac-based-vlan name <name> source-mac <mac-addr> vlan <vlan-id> priority <0-7> | 187 |
| mac-filter name <name> mac <mac-addr> vlan <vlan-id> | 189 |
| mac-filter name <name> mac <mac-addr> vlan <vlan-id> drop <src dst both> | 189 |
| mac-filter name <name> mac <mac-addr> vlan <vlan-id> inactive | 189 |
| mac-flush [<port-num>] | 183 |
| mac-forward name <name> mac <mac-addr> vlan <vlan-id> interface <interface-id> | 191 |
| mac-forward name <name> mac <mac-addr> vlan <vlan-id> interface <interface-id> inactive | 191 |
| mac-pinning | 192 |
| mac-pinning | 192 |
| mac-transfer dynamic-to-filter interface port-channel <port-list> | 183 |
| mac-transfer dynamic-to-filter mac <mac-addr> | 183 |
| mac-transfer dynamic-to-filter vlan <vlan-list> | 183 |
| mac-transfer dynamic-to-forward interface port-channel <port-list> | 184 |
| mac-transfer dynamic-to-forward mac <mac-addr> | 183 |
| mac-transfer dynamic-to-forward vlan <vlan-list> | 184 |
| ma-index | 46 |
| md-index | 46 |
| media-type 10g <SFP+ DAC10G> | 125 |
| mep <mep-id> interface port-channel <port> direction <up down> priority <0-7> | 48 |
| mep <mep-id> interface port-channel <port> direction <up down> priority <0-7> cc-enable | 48 |
| mep <mep-id> interface port-channel <port> direction <up down> priority <0-7> inactive | 48 |
| mep-id | 46 |
| mhf-creation < none default explicit> | 48 |
| mirror | 195 |
| mirror dir <ingress egress both> | 195 |
| mirror-filter egress mac <mac-addr> | 195 |
| mirror-filter egress type <all dest src> | 195 |
| mirror-filter ingress mac <mac-addr> | 195 |
| mirror-filter ingress type <all dest src> | 195 |
| mirror-port | 195 |
| mirror-port <port-num> | 195 |
| mode <dynamic compatible> | 207 |
| mode zynos | 338 |
| mrstp <tree-index> | 198 |
| mrstp <tree-index> hello-time <1-10> maximum-age <6-40> forward-delay <4-30> | 198 |
| mrstp <tree-index> priority <0-61440> | 198 |
| mrstp interface <port-list> | 198 |
| mrstp interface <port-list> edge-port | 199 |
| mrstp interface <port-list> path-cost <1-65535> | 199 |
| mrstp interface <port-list> priority <0-255> | 199 |
| mrstp interface <port-list> rootguard | 199 |
| mrstp interface <port-list> tree-index <tree-index> | 199 |
| mstp | 201 |
| mstp configuration-name <name> | 201 |
| mstp hello-time <1-10> maximum-age <6-40> forward-delay <4-30> | 201 |
| mstp instance <number> interface port-channel <port-list> | 202 |

| | |
|--|-----|
| mstp instance <number> interface port-channel <port-list> path-cost <1-65535> ... | 202 |
| mstp instance <number> interface port-channel <port-list> priority <0-255> | 202 |
| mstp instance <number> priority <0-61440> | 202 |
| mstp instance <number> vlan <vlan-list> | 202 |
| mstp interface port-channel <port-list> edge-port | 201 |
| mstp interface port-channel <port-list> rootguard | 202 |
| mstp max-hop <1-255> | 201 |
| mstp revision <0-65535> | 201 |
| multicast-forward name <name> mac <mac-addr> vlan <vlan-id> inactive | 287 |
| multicast-forward name <name> mac <mac-addr> vlan <vlan-id> interface port-channel <port-list> | 287 |
| multicast-limit | 42 |
| multicast-limit <pkt/s> | 42 |
| multi-login | 206 |
| mvr <1-4094> | 336 |
| mvr <vlan-id> | 207 |
| name <name> | 207 |
| name <name> | 313 |
| name <name> | 330 |
| name <port-name-string> | 125 |
| network <ip-addr/bits> area <area-id> | 213 |
| no aaa accounting commands | 25 |
| no aaa accounting dot1x | 25 |
| no aaa accounting exec | 25 |
| no aaa accounting system | 25 |
| no aaa accounting update | 24 |
| no aaa accounting update | 350 |
| no aaa authentication enable | 24 |
| no aaa authentication enable | 350 |
| no aaa authentication login | 24 |
| no aaa authentication login | 350 |
| no aaa authorization console | 25 |
| no aaa authorization dot1x | 26 |
| no aaa authorization exec | 26 |
| no anti arpscan | 28 |
| no anti arpscan host threshold | 28 |
| no anti arpscan port threshold | 28 |
| no anti arpscan trust host <ip-address> <mask> | 28 |
| no area <area-id> | 212 |
| no area <area-id> authentication | 212 |
| no area <area-id> default-cost | 212 |
| no area <area-id> stub | 212 |
| no area <area-id> stub no-summary | 212 |
| no area <area-id> virtual-link <router-id> | 212 |
| no area <area-id> virtual-link <router-id> authentication-key | 213 |
| no area <area-id> virtual-link <router-id> authentication-same-as-area | 213 |
| no area <area-id> virtual-link <router-id> message-digest-key | 213 |
| no arp | 29 |
| no arp inspection | 31 |
| no arp inspection filter <mac-addr> vlan <vlan-id> | 31 |
| no arp inspection filter-aging-time | 31 |
| no arp inspection filter-aging-time | 350 |
| no arp inspection log-buffer entries | 32 |
| no arp inspection log-buffer entries | 350 |
| no arp inspection log-buffer logs | 32 |
| no arp inspection log-buffer logs | 350 |
| no arp inspection trust | 32 |
| no arp inspection vlan <vlan-list> | 32 |
| no arp inspection vlan <vlan-list> logging | 32 |

| | |
|---|-----|
| no arp ip <ip-address> mac <mac-addr> vlan <vlan-id> inactive | 29 |
| no arp ip <ip-address> mac <mac-addr> vlan <vlan-id> | 29 |
| no arp-learning | 36 |
| no bandwidth-control | 38 |
| no bandwidth-limit cir | 38 |
| no bandwidth-limit egress | 38 |
| no bandwidth-limit ingress | 38 |
| no bandwidth-limit pir | 38 |
| no bmstorm-limit | 42 |
| no bpduguard | 40 |
| no bpduguard | 40 |
| no broadcast-limit | 42 |
| no classifier <name> | 55 |
| no classifier <name> inactive | 55 |
| no classifier logging | 55 |
| no cluster | 57 |
| no cluster member <mac> | 57 |
| no connected-port <port-list> | 196 |
| no destination monitor-port | 196 |
| no dhcp dhcp-vlan | 78 |
| no dhcp option profile <name> | 71 |
| no dhcp relay <vlan-id> | 72 |
| no dhcp relay <vlan-id> information | 72 |
| no dhcp relay <vlan-id> interface port-channel <port-list> option | 72 |
| no dhcp relay <vlan-id> option | 72 |
| no dhcp relay-broadcast | 72 |
| no dhcp server <vlan-id> | 73 |
| no dhcp server <vlan-id> default-gateway | 73 |
| no dhcp server <vlan-id> primary-dns | 73 |
| no dhcp server <vlan-id> secondary-dns | 73 |
| no dhcp smart-relay | 72 |
| no dhcp smart-relay information | 72 |
| no dhcp smart-relay interface port-channel <port-list> | 73 |
| no dhcp smart-relay option | 73 |
| no dhcp snooping | 76 |
| no dhcp snooping database | 76 |
| no dhcp snooping database timeout | 76 |
| no dhcp snooping database write-delay | 77 |
| no dhcp snooping limit rate | 77 |
| no dhcp snooping trust | 77 |
| no dhcp snooping vlan <vlan-list> | 77 |
| no dhcp snooping vlan <vlan-list> information | 77 |
| no dhcp snooping vlan <vlan-list> interface port-channel <port-list> option | 77 |
| no dhcp snooping vlan <vlan-list> option | 77 |
| no dhcp snooping vlan <vlan-list> option | 77 |
| no diffserv | 80 |
| no diffserv | 80 |
| no display aaa <[authentication] [authorization] [server]> | 81 |
| no display user <[system] [snmp]> | 81 |
| no dlf-limit | 42 |
| no egress set <port-list> | 231 |
| no errdisable detect cause <ARP BPDU IGMP> | 85 |
| no errdisable recovery | 85 |
| no errdisable recovery cause <loopguard ARP BPDU IGMP> | 85 |
| no ethernet cfm | 49 |
| no ethernet cfm ma <ma-index> md <md-index> | 49 |
| no ethernet cfm management-address-domain | 49 |
| no ethernet cfm md <md-index> | 49 |
| no ethernet cfm virtual-mac | 49 |

| | |
|---|-----|
| no ethernet oam | 88 |
| no ethernet oam | 89 |
| no ethernet oam mode | 89 |
| no ethernet oam remote-loopback ignore-rx | 89 |
| no ethernet oam remote-loopback supported | 89 |
| no ets traffic-class binding | 67 |
| no except-smac zero-smac-drop | 338 |
| no external-alarm <index> | 94 |
| no external-alarm all | 94 |
| no fixed <port-list> | 313 |
| no flow-control | 125 |
| no forbidden <port-list> | 313 |
| no green-ethernet auto-power-down | 99 |
| no green-ethernet auto-power-down | 99 |
| no green-ethernet eee | 99 |
| no green-ethernet eee | 99 |
| no green-ethernet short-reach | 99 |
| no green-ethernet short-reach | 99 |
| no group | 207 |
| no group <name-str> | 207 |
| no gvrp | 102 |
| no hybrid-spg | 247 |
| no igmp-filtering | 122 |
| no igmp-filtering profile | 122 |
| no igmp-filtering profile <name> | 122 |
| no igmp-filtering profile <name> start-address <ip> end-address <ip> | 122 |
| no igmp-group-limited | 119 |
| no igmp-immediate-leave | 120 |
| no igmp-snooping | 115 |
| no igmp-snooping 8021p-priority | 115 |
| no igmp-snooping authentication | 119 |
| no igmp-snooping authentication-timeout | 115 |
| no igmp-snooping filtering | 115 |
| no igmp-snooping filtering profile | 119 |
| no igmp-snooping filtering profile <name> | 116 |
| no igmp-snooping filtering profile <name> start-address <ip> end-address <ip> ... | 116 |
| no igmp-snooping group-limited | 119 |
| no igmp-snooping leave-proxy | 116 |
| no igmp-snooping querier | 116 |
| no igmp-snooping report-proxy | 116 |
| no igmp-snooping vlan <vlan-id> | 118 |
| no inactive | 125 |
| no inactive | 196 |
| no inactive | 207 |
| no inactive | 313 |
| no inactive | 330 |
| no inactive | 5 |
| no ingress-check | 314 |
| no install slot <slot> | 338 |
| no interface <port-num> | 125 |
| no intrusion-lock | 125 |
| no ip address <ip-address> <mask> | 318 |
| no ip address default-gateway | 319 |
| no ip address default-management dhcp-bootp | 318 |
| no ip dvmrp | 83 |
| no ip igmp | 113 |
| no ip load-sharing | 178 |
| no ip name-server <all ip ipv6> | 130 |
| no ip ospf authentication-key <key> | 211 |

| | |
|--|-----|
| no ip ospf authentication-same-aa | 212 |
| no ip ospf authentication-same-as-area | 212 |
| no ip ospf cost <1-65535> | 212 |
| no ip ospf message-digest-key <key> | 212 |
| no ip ospf priority <0-255> | 212 |
| no ip policy-route <name> | 227 |
| no ip policy-route <name> inactive | 227 |
| no ip policy-route <name> sequence <number> | 227 |
| no ip route <ip> <mask> | 289 |
| no ip route <ip> <mask> <next-hop-ip> | 289 |
| no ip route <ip> <mask> <next-hop-ip> inactive | 289 |
| no ip route <ip> <mask> inactive | 289 |
| no ip source binding <mac-addr> vlan <vlan-id> | 135 |
| no ipmc egress-untag-vlan | 113 |
| no ipv6 | 145 |
| no ipv6 address <ipv6-address>/<prefix> | 145 |
| no ipv6 address <ipv6-address>/<prefix> eui-64 | 145 |
| no ipv6 address <ipv6-address>/<prefix> link-local | 145 |
| no ipv6 address autoconfig | 145 |
| no ipv6 address default-gateway | 145 |
| no ipv6 address dhcp client | 145 |
| no ipv6 address dhcp client [rapid-commit] | 145 |
| no ipv6 address dhcp client option | 145 |
| no ipv6 address dhcp client option <[dns][domain-list]> | 145 |
| no ipv6 dhcp relay vlan <1-4094> | 146 |
| no ipv6 dhcp relay vlan <1-4094> option interface-id | 146 |
| no ipv6 dhcp relay vlan <1-4094> option remote-id | 146 |
| no ipv6 dhcp trust | 146 |
| no ipv6 dhcp trust | 146 |
| no ipv6 hop-limit | 152 |
| no ipv6 mld snooping-proxy | 149 |
| no ipv6 mld snooping-proxy filtering | 149 |
| no ipv6 mld snooping-proxy filtering group-limited | 148 |
| no ipv6 mld snooping-proxy filtering profile | 148 |
| no ipv6 mld snooping-proxy filtering profile <name> | 150 |
| no ipv6 mld snooping-proxy filtering profile <name> start-address <ip> end-address <ip> 150 | |
| no ipv6 mld snooping-proxy vlan <vlan-id> | 150 |
| no ipv6 mld snooping-proxy vlan <vlan-id> downstream interface port-channel <port-list> 150 | |
| no ipv6 mld snooping-proxy vlan <vlan-id> upstream interface port-channel <port-list> 150 | |
| no ipv6 nd dad-attempts | 151 |
| no ipv6 nd managed-config-flag | 152 |
| no ipv6 nd ns-interval | 152 |
| no ipv6 nd other-config-flag | 152 |
| no ipv6 nd prefix <ipv6-prefix>/<prefix-length> | 152 |
| no ipv6 nd ra interval | 152 |
| no ipv6 nd ra lifetime | 152 |
| no ipv6 nd ra suppress | 152 |
| no ipv6 nd reachable-time | 152 |
| no ipv6 neighbor <interface-type> <interface-number> <ipv6-address> | 153 |
| no ipv6 route <ipv6-prefix>/<prefix-length> | 152 |
| no ipv6 snooping attach-policy | 153 |
| no ipv6 snooping policy <name> | 153 |
| no ipv6 source binding <ipv6-address ipv6-address/prefix-length> | 154 |
| no l2protocol-tunnel | 163 |
| no l2protocol-tunnel | 163 |
| no l2protocol-tunnel cdp | 163 |

| | |
|---|-----|
| no l2protocol-tunnel point-to-point | 163 |
| no l2protocol-tunnel point-to-point lacp | 163 |
| no l2protocol-tunnel point-to-point pagp | 163 |
| no l2protocol-tunnel point-to-point udld | 163 |
| no l2protocol-tunnel stp | 163 |
| no l2protocol-tunnel vtp | 163 |
| no lacp | 307 |
| no limit address-count | 153 |
| no lldp | 169 |
| no lldp admin-status | 167 |
| no lldp basic-tlv management-address | 167 |
| no lldp basic-tlv port-description | 168 |
| no lldp basic-tlv system-capabilities | 168 |
| no lldp basic-tlv system-description | 168 |
| no lldp basic-tlv system-name | 168 |
| no lldp dcbx application <ether-type > <fcoe> | 68 |
| no lldp med location <civic coordinate elin> | 168 |
| no lldp med location | 168 |
| no lldp med network-policy | 168 |
| no lldp med network-policy <voice voice-signaling guest-voice guest-voice-signaling softphone-voice vid | 168 |
| no lldp med topology-change-notification | 168 |
| no lldp notification | 168 |
| no lldp org-specific-tlv dot1 port-protocol-vlan-id | 168 |
| no lldp org-specific-tlv dot1 port-vlan-id | 168 |
| no lldp org-specific-tlv dot3 link-aggregation | 168 |
| no lldp org-specific-tlv dot3 mac-phy | 168 |
| no lldp org-specific-tlv dot3 max-frame-size | 168 |
| no lldp org-specific-tlv dot3 power-via-mdi | 168 |
| no locator-led | 338 |
| no logging | 179 |
| no logins username <name> | 180 |
| no loopguard | 181 |
| no loopguard | 181 |
| no mac-authentication | 185 |
| no mac-authentication | 186 |
| no mac-authentication timeout | 186 |
| no mac-authentication trusted-vlan <vlan-list> | 186 |
| no mac-based-vlan source-mac <mac-addr> | 187 |
| no mac-filter mac <mac-addr> vlan <vlan-id> | 189 |
| no mac-filter mac <mac-addr> vlan <vlan-id> inactive | 189 |
| no mac-forward mac <mac-addr> vlan <vlan-id> interface <interface-id> | 191 |
| no mac-forward mac <mac-addr> vlan <vlan-id> interface <interface-id> inactive | 191 |
| no mac-pinning | 192 |
| no mac-pinning | 192 |
| no mep <mep-id> | 48 |
| no mep <mep-id> cc-enable | 48 |
| no mep <mep-id> inactive | 48 |
| no mirror | 195 |
| no mirror-port | 195 |
| no mirror-port <port-num> | 195 |
| no mrstp <tree-index> | 199 |
| no mrstp interface <port-list> | 199 |
| no mrstp interface <port-list> edge-port | 199 |
| no mrstp interface <port-list> rootguard | 199 |
| no mstp | 201 |
| no mstp instance <number> | 202 |
| no mstp instance <number> interface port-channel <port-list> | 202 |
| no mstp instance <number> vlan <1-4094> | 202 |

| | |
|---|-----|
| no mstp interface port-channel <port-list> edge-port | 201 |
| no mstp interface port-channel <port-list> rootguard | 202 |
| no multicast-forward mac <mac-addr> vlan <vlan-id> | 287 |
| no multicast-forward mac <mac-addr> vlan <vlan-id> inactive | 287 |
| no multicast-limit | 42 |
| no multi-login | 206 |
| no mvr <vlan-id> | 207 |
| no network <ip-addr/bits> | 213 |
| no non-querier | 112 |
| no passive-iface <ip-addr/bits> | 214 |
| no password encryption | 217 |
| no password privilege <0-14> | 217 |
| no permit link-local | 154 |
| no policy <name> | 225 |
| no policy <name> inactive | 225 |
| no port-access-authenticator | 109 |
| no port-access-authenticator <port-list> | 109 |
| no port-access-authenticator <port-list> guest-vlan | 109 |
| no port-access-authenticator <port-list> guest-vlan Host-mode | 109 |
| no port-access-authenticator <port-list> reauthenticate | 109 |
| no port-security | 229 |
| no port-security <port-list> | 229 |
| no port-security <port-list> learn inactive | 229 |
| no port-security <port-list> vlan <vlan-id> address-limit | 230 |
| no port-security <port-list> vlan <vlan-id> address-limit inactive | 230 |
| no pppoe intermediate-agent | 233 |
| no pppoe intermediate-agent format-type access-node-identifier | 234 |
| no pppoe intermediate-agent format-type circuit-id | 233 |
| no pppoe intermediate-agent format-type identifier-string | 234 |
| no pppoe intermediate-agent format-type identifier-string hostname | 234 |
| no pppoe intermediate-agent format-type remote-id | 233 |
| no pppoe intermediate-agent trust | 233 |
| no pppoe intermediate-agent vlan <vlan-id> format-type circuit-id | 233 |
| no pppoe intermediate-agent vlan <vlan-id> format-type remote-id | 233 |
| no pppoe intermediate-agent vlan <vlan-list> | 234 |
| no pppoe intermediate-agent vlan <vlan-list> circuit-id | 234 |
| no pppoe intermediate-agent vlan <vlan-list> remote-id | 233 |
| no preempt | 331 |
| no prefix-glean | 153 |
| no primary-virtual-ip | 330 |
| no primary-virtual-ip <ip-address> | 330 |
| no priority-flow-control | 64 |
| no priority-flow-control priority | 64 |
| no private-vlan <primary isolated community> | 241 |
| no private-vlan <vlan-id> | 239 |
| no private-vlan <vlan-id> inactive | 239 |
| no private-vlan association | 241 |
| no private-vlan association <secondary-vlan-list> | 241 |
| no private-vlan mode | 241 |
| no protocol dhcp | 153 |
| no protocol-based-vlan ethernet-type <ether-num ip ipx arp rarp appletalk decnet> | 244 |
| no pwr interface <port-list> | 219 |
| no pwr interface <port-list> max-power | 219 |
| no pwr mibtrap | 219 |
| no radius-accounting <index> | 250 |
| no radius-accounting <index> | 350 |
| no radius-server <index> | 249 |
| no radius-server <index> | 350 |
| no receiver-port <port-list> | 207 |

| | |
|---|-----|
| no redistribute rip | 213 |
| no redistribute static | 214 |
| no remote-management <index> | 251 |
| no remote-management <index> service <[telnet] [ftp] [http] [icmp] [snmp] [ssh] [https]> 251 | |
| no remote-mep <mep-id> | 48 |
| no rmirror vlan <vlan-id> | 196 |
| no rmon alarm alarmtable <alarm-index> | 257 |
| no rmon event eventtable <event-index> | 257 |
| no rmon history historycontrol <historycontrol-index> | 257 |
| no rmon statistics etherstats <etherstats-index> | 257 |
| no router dvmrp | 82 |
| no router igmp | 112 |
| no router ospf | 214 |
| no router rip | 255 |
| no router vrrp network <ip-address>/<mask-bits> vr-id <1~7> | 331 |
| no secondary-virtual-ip | 330 |
| no service-control ftp | 252 |
| no service-control http | 252 |
| no service-control https | 252 |
| no service-control icmp | 252 |
| no service-control snmp | 252 |
| no service-control ssh | 252 |
| no service-control telnet | 252 |
| no sflow | 264 |
| no sflow | 264 |
| no sflow collector <ip-address> | 264 |
| no sflow collector <ip-address> | 265 |
| no shutdown slot <slot-list> | 338 |
| no smart-isolation | 267 |
| no snmp trap [options] | 271 |
| no snmp-server trap-destination <ip> | 271 |
| no snmp-server trap-destination <ip> enable traps | 272 |
| no snmp-server trap-destination <ip> enable traps aaa | 272 |
| no snmp-server trap-destination <ip> enable traps aaa <options> | 272 |
| no snmp-server trap-destination <ip> enable traps interface | 273 |
| no snmp-server trap-destination <ip> enable traps interface <options> | 273 |
| no snmp-server trap-destination <ip> enable traps ip | 273 |
| no snmp-server trap-destination <ip> enable traps ip <options> | 273 |
| no snmp-server trap-destination <ip> enable traps switch | 273 |
| no snmp-server trap-destination <ip> enable traps switch <options> | 273 |
| no snmp-server trap-destination <ip> enable traps system | 273 |
| no snmp-server trap-destination <ip> enable traps system <options> | 273 |
| no snmp-server username <name> | 272 |
| no source mirror-port <port-list> | 196 |
| no source mirror-port <port-list> dir egress | 196 |
| no source mirror-port <port-list> dir ingress | 196 |
| no source reflector-port | 196 |
| no source-port <port-list> | 207 |
| no spanning-tree | 281 |
| no spanning-tree <port-list> | 281 |
| no spanning-tree <port-list> edge-port | 282 |
| no spanning-tree <port-list> rootguard | 282 |
| no ssh key <rsa rsa dsa> | 285 |
| no ssh known-hosts <host-ip> | 285 |
| no ssh known-hosts <host-ip> <1024 ssh-rsa ssh-dsa> | 285 |
| no Stacking | 276 |
| no Stacking force-master | 276 |
| no storm-control | 41 |

| | |
|---|-----|
| no subnet-based-vlan | 292 |
| no subnet-based-vlan dhcp-vlan-override | 293 |
| no subnet-based-vlan source-ip <ip> mask-bits <mask-bits> | 293 |
| no summary-address <ip-address> <mask> | 214 |
| no syslog | 294 |
| no syslog server <ip-address> | 294 |
| no syslog server <ip-address> inactive | 294 |
| no syslog type <type> | 295 |
| no tacacs-accounting <index> | 298 |
| no tacacs-server <index> | 298 |
| no tagged <port-list> | 207 |
| no time daylight-saving-time | 61 |
| no time-range <name> | 303 |
| no timesync | 61 |
| no traffic-class <id> | 67 |
| no trtcm | 309 |
| no trtcm | 310 |
| no trtcm dscp profile | 310 |
| no trtcm dscp profile <name> | 309 |
| no trunk <T1 T2 T3 T4 T5 T6> | 306 |
| no trunk <T1 T2 T3 T4 T5 T6> criteria | 306 |
| no trunk <T1 T2 T3 T4 T5 T6> interface <port-list> | 306 |
| no trunk <T1 T2 T3 T4 T5 T6> lacp | 306 |
| no untagged <port-list> | 313 |
| no validate address | 154 |
| no validate prefix | 154 |
| no vlan <vlan-id> | 313 |
| no vlanlq gvrp | 102 |
| no vlanlq ingress-check | 314 |
| no vlanlq port-isolation | 322 |
| no vlanlq port-isolation | 322 |
| no vlan-mapping | 320 |
| no vlan-mapping | 320 |
| no vlan-mapping interface port-channel <port> vlan <1-4094> | 320 |
| no vlan-mapping interface port-channel <port> vlan <1-4094> inactive | 320 |
| no vlan-stacking | 323 |
| no vlan-stacking selective-qinq interface port-channel <port> cvid <vlan-id> | 323 |
| no vlan-stacking selective-qinq interface port-channel <port> cvid <vlan-id> inactive | 323 |
| no vlan-trunking | 326 |
| no voice-vlan | 327 |
| no voice-vlan oui <mac-addr> mask <mask-addr> | 327 |
| no zuld | 334 |
| no zuld | 335 |
| non-querier | 112 |
| normal <port-list> | 313 |
| owner | 256 |
| passive-iface <ip-addr/bits> | 214 |
| password [cipher] <pw-string> [privilege <0-14>] | 217 |
| password encryption | 217 |
| permit link-local | 154 |
| ping <ip host-name> [vlan <vlan-id>] [size <0-1472>] [-t] | 337 |
| ping help | 337 |
| ping6 <ipv6-address> [-i <interface-type> <interface-number>] [-t] [-l <1-1452>] [-n <1-65535>] [-s <ipv6-address>] | 147 |
| policy <name> classifier <classifier-list> [<vlan <vlan-id>] [egress-port <port-num>] [priority <0-7>] [bandwidth <bandwidth>] [forward-action <drop>] [queue-action <prio-set>] [outgoing-eport] [outgoing-set-vlan] [rate-limit] [inactive]> | 225 |
| policy <name> classifier <classifier-list> [<vlan <vlan-id>] [egress-port <port- | |

| | |
|--|-----|
| num>] [priority <0-7>] [dscp <0-63>] [tos <0-7>] [bandwidth <bandwidth>] [egress-port <port-list>] [outgoing-packet-format <tagged untagged>] [out-of-profile-dscp <0-63>] [forward-action <drop forward egressmask>] [priority-action <[prio-set set-prio-as-inner-prio prio-replace-tos] [queue-action <prio-set prio-queue prio-replace-tos>] [diffserv-action <diff-set-tos diff-replace-priority diff-set-dscp>] [outgoing-mirror] [outgoing-eport] [outgoing-non-unicast-eport] [outgoing-set-vlan] [metering] [out-of-profile-action <[change-dscp] [drop] [forward] [set-drop-precedence]>] [inactive]> | 224 |
| port-access-authenticator | 109 |
| port-access-authenticator <port-list> | 110 |
| port-access-authenticator <port-list> guest-vlan | 110 |
| port-access-authenticator <port-list> guest-vlan <vlan-id> | 110 |
| port-access-authenticator <port-list> guest-vlan Host-mode Multi-host | 110 |
| port-access-authenticator <port-list> guest-vlan Host-mode Multi-secure [<1-24>] | 110 |
| port-access-authenticator <port-list> max-req <1-10> | 110 |
| port-access-authenticator <port-list> quiet-period <0-65535> | 110 |
| port-access-authenticator <port-list> reauthenticate | 110 |
| port-access-authenticator <port-list> reauth-period <1-65535> | 110 |
| port-access-authenticator <port-list> supp-timeout <30-65535> | 110 |
| port-access-authenticator <port-list> tx-period <1-65535> | 110 |
| port-security | 229 |
| port-security <port-list> | 229 |
| port-security <port-list> address-limit <number> | 229 |
| port-security <port-list> learn inactive | 229 |
| port-security <port-list> MAC-freeze | 229 |
| port-security <port-list> vlan <vlan-id> address-limit <number> | 229 |
| port-security <port-list> vlan <vlan-id> address-limit <number> inactive | 230 |
| pppoe intermediate-agent | 234 |
| pppoe intermediate-agent format-type access-node-identifier string <string> | 234 |
| pppoe intermediate-agent format-type circuit-id string <string> | 233 |
| pppoe intermediate-agent format-type identifier-string hostname | 234 |
| pppoe intermediate-agent format-type identifier-string string <string> option <s p v sp sv pv spv> delimiter <# . , ; / > | 234 |
| pppoe intermediate-agent format-type remote-id string <string> | 233 |
| pppoe intermediate-agent trust | 233 |
| pppoe intermediate-agent vlan <vlan-id> format-type circuit-id string <string> .. | 233 |
| pppoe intermediate-agent vlan <vlan-id> format-type remote-id string <string> ... | 233 |
| pppoe intermediate-agent vlan <vlan-list> | 234 |
| pppoe intermediate-agent vlan <vlan-list> circuit-id | 234 |
| pppoe intermediate-agent vlan <vlan-list> remote-id | 234 |
| preempt | 331 |
| prefix-glean | 153 |
| primary-virtual-ip <ip-address> | 330 |
| priority <1~254> | 330 |
| priority-flow-control | 64 |
| priority-flow-control auto | 64 |
| priority-flow-control priority <priority-list> | 64 |
| private-vlan <primary isolated community> | 240 |
| private-vlan association <secondary-vlan-list> | 241 |
| private-vlan mode .. <promiscuous isolated community> association <vlan-id> dot1q <tagged untagged> | 241 |
| private-vlan name <name> vlan <vlan-id> | 239 |
| private-vlan name <name> vlan <vlan-id> inactive | 239 |
| private-vlan name <name> vlan <vlan-id> promiscuous-port <port-list> | 239 |
| private-vlan name <name> vlan <vlan-id> promiscuous-port <port-list> inactive ... | 239 |
| protocol dhcp | 153 |
| protocol-based-vlan name <name> ethernet-type <ether-num ip ipx arp rarp appletalk dec-net> vlan <vlan-id> priority <0-7> | 244 |
| pvid <1-4094> | 125 |

| | |
|--|-----|
| pwr interface <port-list> | 219 |
| pwr interface <port-list> max-power <1000-33000> | 219 |
| pwr interface <port-list> priority <critical high low> | 219 |
| pwr mibtrap | 219 |
| pwr mode <classification consumption> | 220 |
| pwr usagethreshold <1-99> | 220 |
| qos priority <0-7> | 125 |
| queue priority <0-7> level <0-7> | 246 |
| queue priority <0-7> level <0-7> | 248 |
| radius-accounting host <index> <ip> [acct-port <socket-number>] [key [cipher] <key-string>] | 250 |
| radius-accounting timeout <1-1000> | 249 |
| radius-server host <index> <ip> [auth-port <socket-number>] [key [cipher] <key-string>] | 249 |
| radius-server mode <index-priority round-robin> | 249 |
| radius-server timeout <1-1000> | 249 |
| receiver-port <port-list> | 207 |
| redistribute rip | 213 |
| redistribute rip metric-type <1 2> metric <0-16777214> | 213 |
| redistribute static | 214 |
| redistribute static metric-type <1 2> metric <0-16777214> | 214 |
| reload config [1 2] | 337 |
| reload factory-default | 263 |
| reload stacking-default | 277 |
| remote-management <index> | 251 |
| remote-management <index> start-addr <ip> end-addr <ip> service <[telnet] [ftp] [http] [icmp] [snmp] [ssh] [https]> | 251 |
| remote-mep <mep-id> | 48 |
| renew dhcp snooping database | 77 |
| renew dhcp snooping database <tftp://host/filename> | 77 |
| reset cpu-protection interface port-channel <port-list> cause <ARP BPDU IGMP> | 85 |
| reset slot <slot-list> | 337 |
| restart ipv6 dhcp client vlan <1-4094> | 145 |
| rmirror vlan <vlan-id> | 196 |
| rmon alarm alarmtable <alarm-index> variable <variable> interval <interval-integer> sample-type <absolute delta> startup-alarm <startup-alarm> rising-threshold <rising-integer> <event-index> falling-threshold <falling-integer> <event-index> [owner <owner>] | 257 |
| rmon alarm alarmtable <alarm-index> variable <variable> interval <interval-integer> sample-type <absolute delta> startup-alarm <startup-alarm> rising-threshold <rising-integer> <event-index> falling-threshold <falling-integer> <event-index> [owner <owner>] | 258 |
| rmon event eventtable <event-index> [log] [trap <community>] [owner <owner>] [description <description>] | 257 |
| rmon history historycontrol <historycontrol-index> buckets <1-65535> interval <1-3600> port-channel <interface-id> [owner <owner>] | 257 |
| rmon statistics etherstats <etherstats-index> port-channel <interface-id> [owner <owner>] | 257 |
| router dvmrp | 82 |
| router igmp | 112 |
| router ospf <router-id> | 212 |
| router rip | 254 |
| router vrrp network <ip-address>/<mask-bits> vr-id <1-7> uplink-gateway <ip-address> | 330 |
| secondary-virtual-ip <ip-address> | 330 |
| service-control console <timeout> | 251 |
| service-control ftp | 251 |
| service-control ftp <socket-number> <timeout> | 252 |
| service-control http | 252 |

| | |
|---|-----|
| service-control http <socket-number> <timeout> | 252 |
| service-control https | 252 |
| service-control https <socket-number> | 252 |
| service-control icmp | 252 |
| service-control snmp | 252 |
| service-control ssh | 252 |
| service-control ssh <socket-number> | 252 |
| service-control telnet | 252 |
| service-control telnet <socket-number> <timeout> | 252 |
| sflow | 264 |
| sflow | 265 |
| sflow collector <ip-address> [poll-interval <20-120>] [sample-rate <256-65535>] | 264 |
| sflow collector <ip-address> [udp-port <udp-port>] | 265 |
| show aaa accounting | 24 |
| show aaa accounting commands | 24 |
| show aaa accounting dot1x | 25 |
| show aaa accounting exec | 25 |
| show aaa accounting system | 25 |
| show aaa accounting update | 24 |
| show aaa authentication | 24 |
| show aaa authentication enable | 24 |
| show aaa authentication login | 24 |
| show aaa authorization | 25 |
| show aaa authorization dot1x | 25 |
| show aaa authorization exec | 25 |
| show allarm-status | 337 |
| show anti arpscan | 28 |
| show anti arpscan host | 28 |
| show arp inspection | 31 |
| show arp inspection filter [<mac-addr>] [vlan <vlan-id>] | 31 |
| show arp inspection interface port-channel <port-list> | 32 |
| show arp inspection log | 32 |
| show arp inspection statistics | 31 |
| show arp inspection statistics vlan <vlan-list> | 31 |
| show arp inspection vlan <vlan-list> | 32 |
| show bpdupguard | 40 |
| show classifier [<name>] | 53 |
| show cluster | 57 |
| show cluster candidates | 57 |
| show cluster member | 57 |
| show cluster member config | 57 |
| show cluster member mac <mac> | 57 |
| show cpu-protection interface port-channel <port-list> | 85 |
| show cpu-utilization | 337 |
| show cpu-utilization process | 337 |
| show dhcp option profile | 71 |
| show dhcp relay <vlan-id> | 71 |
| show dhcp server | 73 |
| show dhcp server <vlan-id> | 73 |
| show dhcp smart-relay | 72 |
| show dhcp snooping | 76 |
| show dhcp snooping binding | 76 |
| show dhcp snooping database | 76 |
| show dhcp snooping database detail | 76 |
| show dhcp snooping option [vlan <vlan-list>] [interface <port-list>] | 76 |
| show diffserv | 80 |
| show errdisable | 86 |
| show errdisable detect | 86 |
| show errdisable recovery | 86 |

| | |
|---|-----|
| show ethernet cfm linktrace | 49 |
| show ethernet cfm local | 49 |
| show ethernet cfm local stack | 49 |
| show ethernet cfm local stack mep | 49 |
| show ethernet cfm local stack mep <mep-id> ma <ma-index> md <md-index> | 49 |
| show ethernet cfm local stack mep <mep-id> ma <ma-index> md <md-index> mep-ccmdb [remote- mep <mep-id>] | 49 |
| show ethernet cfm local stack mip | 49 |
| show ethernet cfm local stack mip mip-ccmdb | 49 |
| show ethernet cfm remote | 49 |
| show ethernet cfm virtual-mac | 49 |
| show ethernet cfm virtual-mac port <port-list> | 49 |
| show ethernet oam discovery <port-list> | 88 |
| show ethernet oam statistics <port-list> | 88 |
| show ethernet oam summary | 88 |
| show except-smac | 337 |
| show external-alarm | 94 |
| show garp | 96 |
| show green-ethernet auto-power-down | 99 |
| show green-ethernet eee | 99 |
| show green-ethernet short-reach | 99 |
| show hardware-monitor <C F> | 337 |
| show https | 105 |
| show https certificate | 105 |
| show https key <rsa dsa> | 105 |
| show https session | 105 |
| show igmp-filtering profile | 122 |
| show igmp-snooping | 116 |
| show igmp-snooping filtering profile | 116 |
| show igmp-snooping group all | 116 |
| show igmp-snooping group client < [vlan <vlan-list>] [interface port-channel <port- list>] [multicast-group <group-address>] > | 117 |
| show igmp-snooping group client all | 117 |
| show igmp-snooping group count | 117 |
| show igmp-snooping group interface port-channel <port-list> | 117 |
| show igmp-snooping group interface port-channel <port-list> count | 117 |
| show igmp-snooping group vlan <vlan-list> | 117 |
| show igmp-snooping group vlan <vlan-list> count | 117 |
| show igmp-snooping querier | 117 |
| show igmp-snooping statistics interface port-channel <port-list> | 117 |
| show igmp-snooping statistics system | 117 |
| show igmp-snooping statistics vlan <vlan-list> | 117 |
| show igmp-snooping vlan | 117 |
| show interfaces <port-list> | 125 |
| show interfaces config <port-list> | 125 |
| show interfaces config <port-list> bandwidth-control | 38 |
| show interfaces config <port-list> bstorm-control | 41 |
| show interfaces config <port-list> egress | 231 |
| show interfaces config <port-list> igmp-filtering | 122 |
| show interfaces config <port-list> igmp-group-limited | 118 |
| show interfaces config <port-list> igmp-immediate-leave | 118 |
| show interfaces config <port-list> igmp-query-mode | 118 |
| show interfaces config <port-list> igmp-snooping filtering | 118 |
| show interfaces config <port-list> igmp-snooping group-limited | 118 |
| show interfaces config <port-list> igmp-snooping leave-mode | 118 |
| show interfaces config <port-list> igmp-snooping query-mode | 118 |
| show interfaces config <port-list> protocol-based-vlan | 243 |
| show interfaces config <port-list> trtcm dscp profile | 309 |
| show interfaces transceiver <port-list> | 337 |

| | |
|--|-----|
| show ip | 130 |
| show ip arp | 29 |
| show ip dvmrp group | 82 |
| show ip dvmrp interface | 82 |
| show ip dvmrp neighbor | 82 |
| show ip dvmrp prune | 82 |
| show ip dvmrp route | 82 |
| show ip igmp group | 113 |
| show ip igmp interface | 113 |
| show ip igmp multicast | 113 |
| show ip igmp timer | 113 |
| show ip iptable all [IP VID PORT] | 130 |
| show ip iptable count | 130 |
| show ip iptable static | 130 |
| show ip name-server | 130 |
| show ip ospf database | 211 |
| show ip ospf interface | 211 |
| show ip ospf neighbor | 211 |
| show ip policy-route | 227 |
| show ip policy-route <name> | 227 |
| show ip policy-route <name> sequence <number> | 227 |
| show ip protocols | 211 |
| show ip protocols | 254 |
| show ip route | 289 |
| show ip route static | 289 |
| show ip source binding [<mac-addr>] [...] | 135 |
| show ip source binding help | 135 |
| show ip tcp | 131 |
| show ip udp | 131 |
| show ipv6 | 130 |
| show ipv6 | 145 |
| show ipv6 <interface-type> <interface-number> | 146 |
| show ipv6 dhcp | 146 |
| show ipv6 dhcp vlan <1-4094> | 146 |
| show ipv6 mld snooping-proxy | 150 |
| show ipv6 mld snooping-proxy filtering profile | 150 |
| show ipv6 mld snooping-proxy group | 150 |
| show ipv6 mld snooping-proxy statistics interface port-channel <port-list> | 150 |
| show ipv6 mld snooping-proxy statistics system | 150 |
| show ipv6 mld snooping-proxy statistics vlan <vlan-list> | 150 |
| show ipv6 mld snooping-proxy vlan <vlan-id> | 150 |
| show ipv6 mtu | 147 |
| show ipv6 multicast | 150 |
| show ipv6 neighbor | 153 |
| show ipv6 neighbor <interface-type> <interface-number> | 153 |
| show ipv6 prefix | 152 |
| show ipv6 prefix <interface-type> <interface-number> | 152 |
| show ipv6 route | 152 |
| show ipv6 route static | 152 |
| show ipv6 router | 153 |
| show ipv6 router <interface-type> <interface-number> | 153 |
| show ipv6 snooping policy [<name>] | 153 |
| show ipv6 source binding | 154 |
| show ipv6 source binding [ipv6-address ipv6-address/prefix-length] [mac <mac-address>] [vlan <vlan-id>] [interface port-channel <port-list>] [dhcpv6-snooping static] 154 | |
| show ipv6 source binding count | 154 |
| show ipv6 source-guard policy [<name>] | 154 |
| show l2protocol-tunnel | 163 |

| | |
|--|-----|
| show l2protocol-tunnel interface port-channel <port-list> | 163 |
| show lacp | 307 |
| show lldp config | 169 |
| show lldp config interface port-channel <port-list> | 169 |
| show lldp info local | 169 |
| show lldp info local interface port-channel <port-list> | 169 |
| show lldp info remote | 169 |
| show lldp info remote interface port-channel <port-list> | 169 |
| show lldp statistic | 169 |
| show lldp statistic interface port-channel <port-list> | 169 |
| show logging | 179 |
| show logins | 180 |
| show loopguard | 181 |
| show mac address-table all [<sort>] | 183 |
| show mac address-table count | 183 |
| show mac address-table mac <mac-addr> | 183 |
| show mac address-table multicast | 183 |
| show mac address-table multicast | 287 |
| show mac address-table port <port-list> [<sort>] | 183 |
| show mac address-table static | 183 |
| show mac address-table vlan <vlan-list> [<sort>] | 183 |
| show mac-aging-time | 183 |
| show mac-authentication | 185 |
| show mac-authentication config | 185 |
| show mac-based-vlan | 187 |
| show mac-pinning | 192 |
| show memory | 337 |
| show mirror | 195 |
| show mrstp <tree-index> | 198 |
| show mstp | 201 |
| show mstp instance <number> | 202 |
| show multicast [vlan] | 117 |
| show multi-login | 206 |
| show mvr | 207 |
| show mvr <vlan-id> | 207 |
| show poe-status | 219 |
| show policy | 223 |
| show policy <name> | 223 |
| show port-access-authenticator | 110 |
| show port-access-authenticator <port-list> | 110 |
| show port-security | 229 |
| show port-security <port-list> | 229 |
| show power-source-status | 337 |
| show pppoe intermediate-agent | 234 |
| show pppoe intermediate-agent statistic | 234 |
| show pppoe intermediate-agent statistic vlan <vlan-list> | 234 |
| show priority-flow-control | 65 |
| show priority-flow-control statistics interface port-channel <port-list> | 65 |
| show private-vlan | 239 |
| show private-vlan <vlan-id> | 239 |
| show pwr | 219 |
| show radius-accounting | 249 |
| show radius-server | 249 |
| show remote-management [index] | 251 |
| show rmirror vlan | 196 |
| show rmirror vlan <vlan-id> | 196 |
| show rmon alarm alarmtable [alarm-index] | 257 |
| show rmon event eventtable [event-index] | 257 |
| show rmon history historycontrol [index <historycontrol-index>] | 257 |

| | |
|---|-----|
| show rmon history historycontrol port-channel <interface-id> | 257 |
| show rmon statistics etherstats [index <etherstats-index>] | 257 |
| show rmon statistics etherstats port-channel <interface-id> | 257 |
| show rootguard | 337 |
| show router dvmrp | 82 |
| show router igmp | 113 |
| show router ospf | 211 |
| show router ospf area | 211 |
| show router ospf network | 211 |
| show router ospf redistribute | 211 |
| show router ospf summary-address | 214 |
| show router ospf virtual-link | 211 |
| show router rip | 254 |
| show router vrrp | 331 |
| show running-config | 276 |
| show running-config [interface port-channel <port-list> [<attribute> [<...>]]] .. | 263 |
| show running-config help | 263 |
| show running-config page | 263 |
| show service-control | 251 |
| show sflow | 265 |
| show sfp <port-list> | 337 |
| show slot | 337 |
| show slot config | 337 |
| show slot config <slot-list> | 337 |
| show smart-isolation | 267 |
| show snmp-server | 270 |
| show snmp-server [user] | 272 |
| show spanning-tree config | 281 |
| show ssh | 285 |
| show ssh key <rsa1 rsa dsa> | 285 |
| show ssh known-hosts | 285 |
| show ssh session | 285 |
| show stacking | 276 |
| show stacking slot <number> | 276 |
| show stacking slot status | 276 |
| show subnet-vlan | 292 |
| show system-information | 276 |
| show system-information | 337 |
| show tacacs-accounting | 298 |
| show tacacs-server | 298 |
| show tech-support | 299 |
| show tech-support cpu | 299 |
| show tech-support crash | 299 |
| show tech-support mbuf | 299 |
| show tech-support memory | 299 |
| show time | 60 |
| show time-range <name> | 303 |
| show timesync | 61 |
| show traffic-class | 67 |
| show trtcm dscp profile | 309 |
| show trunk | 306 |
| show version [flash] | 337 |
| show vlan | 313 |
| show vlan | 5 |
| show vlan <vlan-id> | 313 |
| show vlan <vlan-id> | 318 |
| show vlan <vlan-id> counters | 313 |
| show vlan <vlan-id> interface port-channel <port-num> counters | 313 |
| show vlan private-vlan | 241 |

| | |
|---|-----|
| show vlan private-vlan <vlan-id> | 241 |
| show vlanlq gvrp | 102 |
| show vlanlq ingress-check | 314 |
| show vlanlq port-isolation | 322 |
| show vlan-stacking | 323 |
| show voice-vlan | 327 |
| show zuld [<port-list>] | 335 |
| show zuld summary | 335 |
| shutdown slot <slot-list> | 338 |
| smart-isolation | 267 |
| snmp trap [options] | 271 |
| snmp-server [<contact <system-contact>] [location <system-location>]> | 270 |
| snmp-server get-community [cipher] <property> | 270 |
| snmp-server set-community [cipher] <property> | 270 |
| snmp-server trap-community [cipher] <property> | 271 |
| snmp-server trap-destination <ip> [udp-port <socket-number>] [version <v1 v2c v3>] [username <name>] | 271 |
| snmp-server trap-destination <ip> enable traps | 272 |
| snmp-server trap-destination <ip> enable traps <aaa interface ip switch system> [op- tions] | 271 |
| snmp-server trap-destination <ip> enable traps aaa | 272 |
| snmp-server trap-destination <ip> enable traps aaa <options> | 272 |
| snmp-server trap-destination <ip> enable traps interface | 273 |
| snmp-server trap-destination <ip> enable traps interface <options> | 273 |
| snmp-server trap-destination <ip> enable traps ip | 273 |
| snmp-server trap-destination <ip> enable traps ip <options> | 273 |
| snmp-server trap-destination <ip> enable traps switch | 273 |
| snmp-server trap-destination <ip> enable traps switch <options> | 273 |
| snmp-server trap-destination <ip> enable traps system | 273 |
| snmp-server trap-destination <ip> enable traps system <options> | 273 |
| snmp-server username <name> sec-level <noauth auth priv> [auth <md5 sha> auth-password [cipher] <password>] [priv <des aes> priv-password [cipher] <password>] group <group-name> | 272 |
| snmp-server version <v2c v3 v3v2c> | 270 |
| source 8021p-priority <0 - 7> | 196 |
| source mirror-port <port-list> dir <ingress egress both> | 196 |
| source reflector-port | 196 |
| source reflector-port <port-num> | 196 |
| source-port <port-list> | 207 |
| spanning-tree | 281 |
| spanning-tree <port-list> | 281 |
| spanning-tree <port-list> edge-port | 282 |
| spanning-tree <port-list> path-cost <1-65535> | 282 |
| spanning-tree <port-list> priority <0-255> | 282 |
| spanning-tree <port-list> rootguard | 282 |
| spanning-tree hello-time <1-10> maximum-age <6-40> forward-delay <4-30> | 281 |
| spanning-tree help | 282 |
| spanning-tree mode <RSTP MRSTP MSTP> | 198 |
| spanning-tree mode <RSTP MRSTP MSTP> | 201 |
| spanning-tree mode <RSTP MRSTP MSTP> | 281 |
| spanning-tree priority <0-61440> | 281 |
| speed-duplex <auto 10-half 10-full 100-half 100-full 1000-full 1000-auto 10000- full 40000-full> | 125 |
| spq | 246 |
| spq | 248 |
| ssh <1 2> [<user@>dest-ip] [command </>] | 285 |
| ssh known-hosts <host-ip> <1024 ssh-rsa ssh-dsa> <key> | 285 |
| Stacking | 276 |
| Stacking force-master | 276 |

| | |
|--|-----|
| Stacking priority <1-63> | 276 |
| Stacking slot-id <current slot-id> renumber <new slot-id> | 277 |
| Stacking slot-id <current slot-id> renumber auto | 276 |
| storm-control | 41 |
| subnet-based-vlan | 292 |
| subnet-based-vlan dhcp-vlan-override | 292 |
| subnet-based-vlan name <name> source-ip <ip> mask-bits <mask-bits> source-port <port> vlan <vlan-id> priority <0-7> | 292 |
| subnet-based-vlan name <name> source-ip <ip> mask-bits <mask-bits> vlan <vlan-id> pri- ority <0-7> | 292 |
| subnet-based-vlan name <name> source-ip <ip> mask-bits <mask-bits> vlan <vlan-id> pri- ority <0-7> inactive | 292 |
| summary-address <ip-address> <mask> | 214 |
| sync running-config | 263 |
| syslog | 294 |
| syslog server <ip-address> inactive | 294 |
| syslog server <ip-address> level <level> | 294 |
| syslog type <type> | 294 |
| syslog type <type> facility <0-7> | 294 |
| syslog type commands privilege <0-14> | 295 |
| tacacs-accounting host <index> <ip> [acct-port <socket-number>] [key [cipher] <key- string>] | 298 |
| tacacs-accounting timeout <1-1000> | 298 |
| tacacs-server host <index> <ip> [auth-port <socket-number>] [key [cipher] <key-string>] 298 | |
| tacacs-server mode <index-priority round-robin> | 298 |
| tacacs-server timeout <1-1000> | 298 |
| tagged <port-list> | 207 |
| tech-support cpu <threshold> keep <time> | 299 |
| tech-support mbuf <threshold> | 299 |
| telnet ipv4_address | 338 |
| test interface port-channel <port-list> | 338 |
| threshold <tth-value> | 82 |
| time <hour:min:sec> | 60 |
| time date <month/day/year> | 60 |
| time daylight-saving-time | 60 |
| time daylight-saving-time end-date <week> <day> <month> <o'clock> | 61 |
| time daylight-saving-time help | 61 |
| time daylight-saving-time start-date <week> <day> <month> <o'clock> | 61 |
| time timezone <-1200 ... 1200> | 60 |
| time-range <name> [absolute start <hh:mm> <1-31> <jan-dec> <1970-2037> end <hh:mm> <1- 31> <jan-dec> <1970-2037> | 303 |
| time-range <name> [periodic [<monday tuesday wednesday thursday friday saturday sun- day><hh:mm> to monday tuesday wednesday thursday friday saturday sunday> <hh:mm>] [<[monday] [tuesday] [wednesday] [thursday] [friday] [saturday] [sunday] dai- ly weekdays weekend> <hh:mm> to <hh:mm>] | 303 |
| timesync <daytime time ntp> | 61 |
| timesync server <address> | 61 |
| traceroute <ip host-name> [vlan <vlan-id>] [ttl <1-255>] [wait <1-60>] [queries <1-10>] 305 | |
| traceroute help | 305 |
| traceroute6 <ipv6-addr host-name> <[ttl <1-255>] [wait <1-60>] [queries <1-10>]> | 305 |
| traceroute6 help | 305 |
| traffic-class <id> scheduler <sp ets <weight>> [name <name>] | 67 |
| transceiver-ddm timer <1 - 4294967> | 338 |
| trtcm | 309 |
| trtcm | 309 |
| trtcm cir <rate> | 310 |
| trtcm dscp green <0-63> | 310 |

| | |
|--|-----|
| trtcm dscp profile <name> | 310 |
| trtcm dscp profile <name> dscp green <0-63> yellow <0-63> red <0-63> | 309 |
| trtcm dscp red <0-63> | 310 |
| trtcm dscp yellow <0-63> | 310 |
| trtcm mode <color-aware color-blind> | 309 |
| trtcm pir <rate> | 310 |
| trunk <T1 T2 T3 T4 T5 T6> | 306 |
| trunk <T1 T2 T3 T4 T5 T6> criteria <src-mac dst-mac src-dst-mac src-ip dst-ip src-dst-ip> | 306 |
| trunk <T1 T2 T3 T4 T5 T6> interface <port-list> | 306 |
| trunk <T1 T2 T3 T4 T5 T6> lacp | 306 |
| trunk interface <port-list> timeout <lacp-timeout> | 306 |
| unicast-nonunicast-weight <weight> <weight> | 67 |
| unknown-multicast-frame <drop flooding> | 112 |
| untagged <port-list> | 313 |
| validate address | 154 |
| validate prefix | 154 |
| vlan <1-4094> | 318 |
| vlan <1-4094> | 336 |
| vlan <1-4094> | 5 |
| vlan <vlan-id> | 240 |
| vlan <vlan-id> | 313 |
| vlanlq gvrp | 102 |
| vlanlq ingress-check | 314 |
| vlanlq port-isolation | 322 |
| vlanlq port-isolation | 322 |
| vlan-mapping | 320 |
| vlan-mapping | 320 |
| vlan-mapping name <name> interface port-channel <port> vlan <1-4094> translated-vlan <1-4094> priority <0-7> | 320 |
| vlan-mapping name <name> interface port-channel <port> vlan <1-4094> translated-vlan <1-4094> priority <0-7> inactive | 320 |
| vlan-stacking | 323 |
| vlan-stacking <sptpid> | 324 |
| vlan-stacking priority <0-7> | 323 |
| vlan-stacking role <normal access tunnel> | 323 |
| vlan-stacking selective-qinq name <name> interface port-channel <port> cvid <cvid> spvid <spvid> priority <0-7> | 324 |
| vlan-stacking selective-qinq name <name> interface port-channel <port> cvid <cvid> spvid <spvid> priority <0-7> inactive | 324 |
| vlan-stacking SPVID <1-4094> | 323 |
| vlan-stacking tunnel-tpid <tpid> | 323 |
| vlan-trunking | 326 |
| vlan-type <802.1q port-based> | 231 |
| vlan-type <802.1q port-based> | 313 |
| voice-vlan <vlan-id> | 327 |
| voice-vlan oui <mac-addr> mask <mask-addr> description <description> | 327 |
| voice-vlan priority <0-7> | 327 |
| weight <wt1> <wt2> ... <wt8> | 247 |
| wfq | 247 |
| wfq | 248 |
| write memory [<index>] | 338 |
| wrr | 247 |
| wrr | 248 |
| wrr <wt1> <wt2> ... <wt8> | 247 |
| zuld | 334 |
| zuld | 335 |
| zuld mode <normal aggressive> | 335 |
| zuld probe-time <5-65535> | 335 |